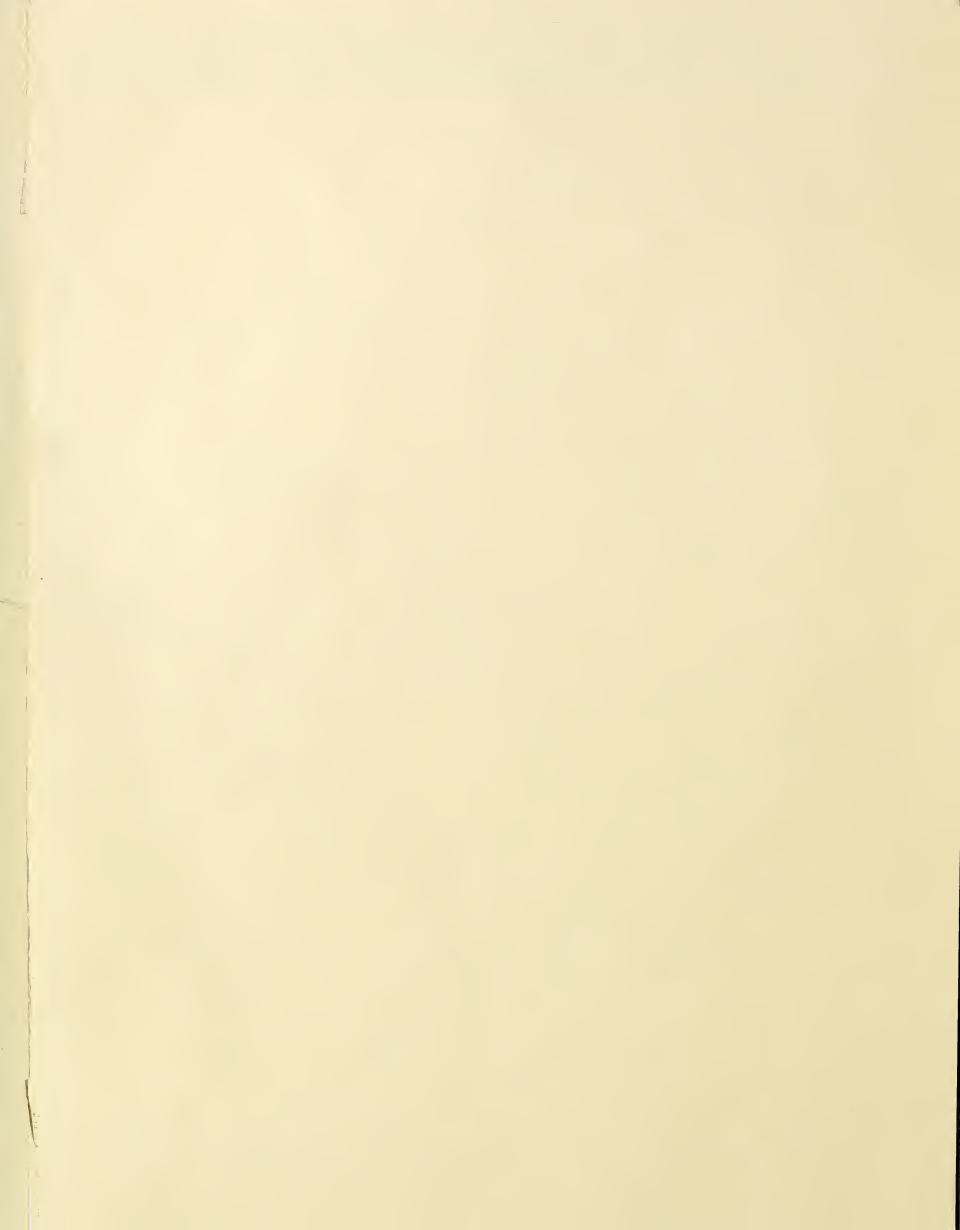
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BETTER FRUIT

VOLUME XIV

APRIL, 1920

NUMBER 10

FEATURES IN THIS ISSUE:

Growing the Almond in California
Dusting and the Spray Gun
Cold Storage Investigations
Cultivating the Loganberry
Low Temperatures and Fruit Buds

Proute De A RETICULÇOND





THE BARTLETT PEAR

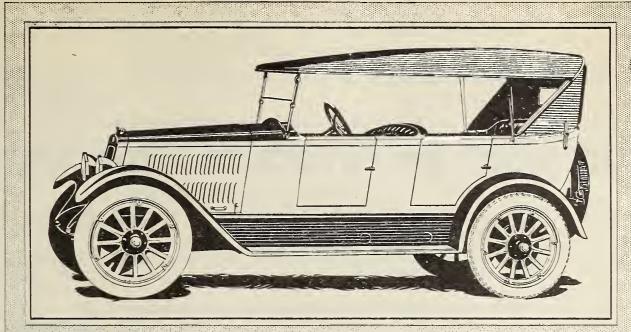
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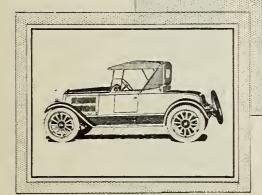
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VOLUME XIV

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Number 10

The Growing and Culture of Almonds in California

By R. H. Taylor Published by the College of Agriculture, Berkeley, California

THE almond (prunus communis) is supposed to be native to the countries around the Mediterranean and at present the bulk of the world's supply is produced in that region. It resembles the peach somewhat in manner of growth and character of blossoms and leaves, but the wood is much harder and the tree is longer-lived under equally favorable conditions. The fruit, instead of having a thick, fleshy pericarp as in the case of the peach, has a thin, leathery pericarp or hull, which splits on ripening and generally opens when dry, exposing the nut inside.

California produces over 98 per cent of the entire American crop and has done so for many years. During the period from 1900 to 1913 the number of bearing trees remained approximately the same, new plantings having replaced old orchards that were being pulled out. The variation in California production from year to year prior to 1915, is due to seasonal variations rather than to change in acreage.

With the 1915 crop the production in California entered upon what appears to be a long prospective increase. The large acreage of almonds set out in the last four or five years is the result of greatly improved market conditions due to the successful work of the California Almond Growers' Exchange. The first of these new plantings are now coming into bearing, and each year for many years in the future will continue to see increased yields. Large acreages are still being planted so that the almond production in California bids fair to continue to grow.

Within the next few years California growers will, in all probability, be forced to accept lower prices for their almonds than they are now receiving. The American markets are fully supplied at present prices, yet constantly increasing acreage will inevitably result in a greatly increased tonnage. European almonds are being produced at a lower net cost and can be laid down on the Atlantic Coast more cheaply than is possible with the California product. This brings the grower face to face with the necessity of becoming more thoroughly familiar with the most economical methods of production and marketing if they are to continue to

make a profit. It is essential, therefore, that a careful study be made of all the factors concerned in the growth, production and final disposition of the almand crop.

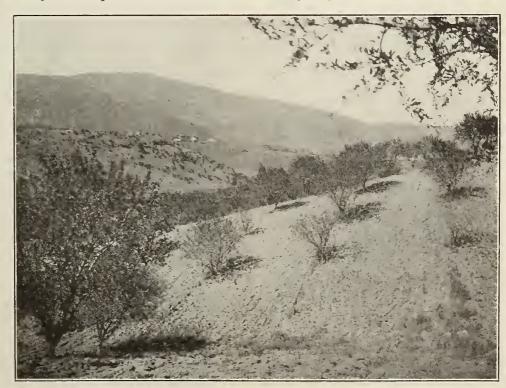
Habits

The almond is the first of the deciduous fruit trees to start growth and come into bloom in the spring, and normally the last one to shed its leaves in the fall. In other words, it has a very short period of rest. When the trees are forced into premature dormancy by mites or lack of moisture, they soon reach the end of their normal rest period before the winter season is over. Then the first warm weather in spring will bring the trees into blossoin. In some cases where moisture and temperature conditions are favorable late in the fall, they may actually blossom before the winter season. In young trees that have become dormant unusually early, the rest period may terminate and then the tips of the branches resume growth and continue to slowly develop new leaves at the

terminals throughout the winter. Trees which have been kept growing thriftily until the leaves have been forced to fall by the cold weather and frosts of winter, do not tend to blossom as early in the spring, nor do they open under the influence of a few days of warm weather in late winter or early spring.

Young trees blossom somewhat later than the older trees, and buds on sucker growth blossom later than the more mature portions of the same tree. The difference may amount to three or four days or almost a week. Well-grown trees carry large numbers of blossoms over the entire tree.

The wood of the almond is very hard and strong, enabling the tree to bear the weight of heavy crops where prun-ing has been given proper attention during the formative period of the young tree. As with other fruit trees, the almond is subject to heart-rot and care should always be exercised to prevent the checking and cracking of large wounds and consequent infection with decay organisms. The hardness of the



Courtesy College of Agriculture, Berkeley, California

Typical hillside orchard of Jordan almonds near Los Gatos. Trees are variable in size and some are missing. In the right foreground is a typical spot of missing trees resulting from oak fungus infection.



Courtesy College of Agriculture, Berkeley, California
Showing almond trees that have been deheaded and topworked. This illustration
shows the trees after the tops have had two seasons' growth and just after they
had been pruned.

wood makes it the finest kind of fuel and when old orchards are being dug up the returns from the sale of wood often more than pay for the expense of digging and cutting up the trees and burning the brush.

The nuts are of two general classes—sweet and bitter almonds. The former is primarily the almond of commerce, though the latter is used largely in the manufacture of almond oil and almond flavoring, as well as in the manufacture of prussic acid. The bitter almond is also used largely in nurseries as a root-stock upon which to bud the almond and some other fruits.

For a long time there has been considerable evidence to show that some varieties are always self-sterile while a few are sometimes self-fertile. Work done in 1916 and 1917 by Prof. Tufts shows that practically all varieties are self-sterile and that some of the self-sterile varieties are also inter-sterile. In these tests the principal commercial varieties were used. Blossoms of each variety were pollenized with pollen from its own blossoms and from each of the others. Checks were for natural pollination with each variety. The important results of this work are briefly summarized as follows:

The Nonpariel and I.X.L. are intersterile, although both are inter-fertile with the Ne Plus Ultra.

The Languedoc and Texas are intersterile.

The I.X.L. and Peerless are practically inter-sterile.

The California has proved the best pollenizer thus far tested, for all varieties that bloom near it.

The Drake is inter-fertile with the Nonpareil, I.X.L., Ne Plus Ultra, Peerless and Jordan, the only ones tested.

The I.X.L. is inter-fertile with the Drake, Jordan, California, Languedoc, Ne Plus Ultra and Texas.

The Ne Plus Ultra is inter-fertile with the California, Drake, I.X.L., Languedoc and Nonpareil.

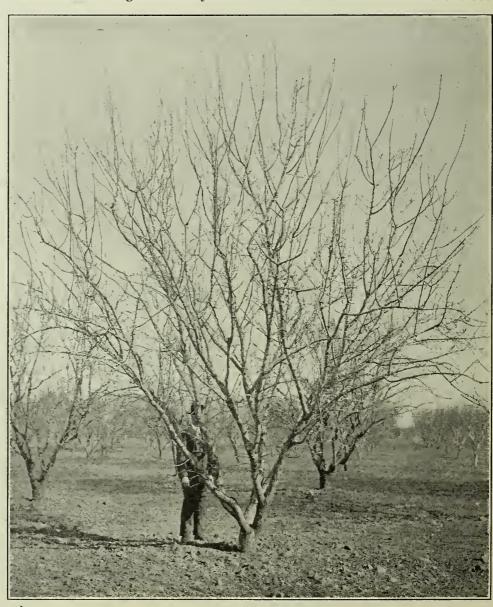
Requirements

While the almond is in many ways an easy tree to grow where conditions are favorable, it is more particular in its requirements than most common orchard fruits. and the grower may find it difficult to produce a good, thrifty tree unless he chooses the proper location. Very often it will grow well and make a fine healthy tree, but owing to unfavorable conditions, will not bear regularly, if at all.

Climate

Heat-Where the conditions of soil and moisture are favorable the almond will endure the intense heat of the interior valleys and even of the Imperial Valley, provided it is pruned properly to shade the main branches so as to prevent sunburn. Where trees, by severe pruning, are opened up suddenly to the intense heat of the summer sun, almonds will sunburn, but if the necessary opening up is done gradually, the bark will become inured to the new conditions without danger. The nuts grow and ripen more satisfactorily in the greater heat of the interior than along the coast.

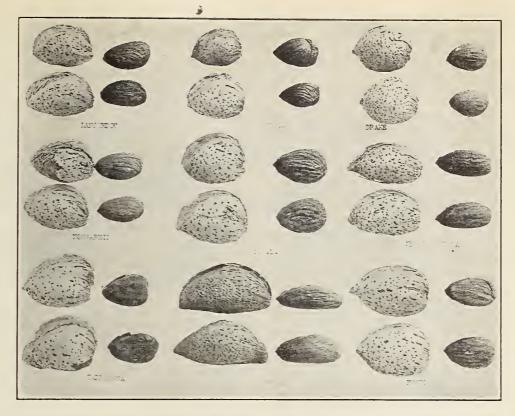
Frost—The almond tree is hardy and will endure fully as much cold as the hardiest peach without injury. Trees are found growing well in Illinois, Ohio, New York and other Eastern states. In very favorable seasons they may even bear fruit, though this happens very seldom, due to the extremely early habit of blooming before the spring frosts are over. The first warm weather seems to start the trees into



Courtesy College of Agriculture, Berkeley, California
Typical Ne Plus Ultra almond tree in University Farm orchard at Davis, California,
nine years old.

bloom, especially where the enforced dormant season of winter is very long.

The blossoms, on the other hand, are very tender. There is a great range in the degree of frost which will cause injury, depending largely on the condi-tion of the tree during the time that the fruit buds are forming and developing, as well as on the duration and severity of the frost. Buds and blossoms on trees which have been forced into premature dormancy, either by lack of moisture or by severe attacks of red spider, are much more susceptible to frost than those on trees which have continued growth late enough in the fall to provide for the proper development and maturity of the buds. After differentiation of fruit buds commences in the summer, the almond leaves should remain on the tree until late into the fall in order to strengthen and develop the fruit buds and store up the elaborated food material for the use of the buds in their normal development through the winter. Studies of almond buds gathered from healthy trees which held their leaves until late fall frosts at Davis, showed the first evidence of differentiation between fruit and flower buds commencing about August 18, while the flower was not completely developed until February 18 following. During the intervening time development proceeded unchecked through the winter even though the tree was apparently dormant. During the time the crop is ripening on the trees, little is done toward storing food material for the buds. If the leaves turn yellow or drop soon after harvest, the trees do not have the opportunity of storing a sufficient supply of plant food for their normal requirements and the buds are insufficiently nourished during the winter period. The resulting buds are weakened and the indications are that they are unable to endure unfavorable climatic conditions in the spring, such as light frosts, continued cold weather



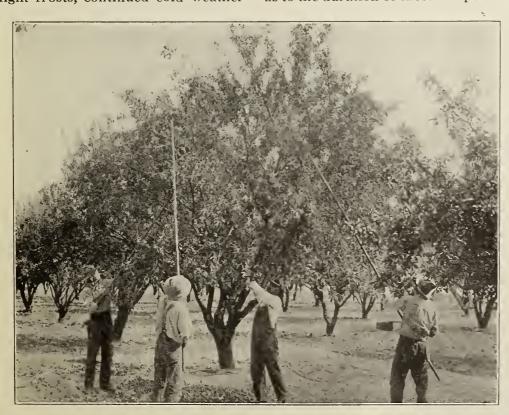
Courtesy College of Agriculture, Berkeley, California Illustration showing some of the almond varieties grown in California.

or sudden changes from warm to cold weather.

The most tender stage in the blossoming and development of the young fruit seems to be immediately following the dropping of the calyx lobes from the young fruit as it first commences to swell rapidly. The blossom becomes more and more tender as it opens out and reaches the above stage. After the young fruit has attained the size of a pea it rapidly becomes more resistant to low temperatures. Blossoms with the petals exposed but not yet opened have been known to stand temperatures of 24 degrees F. and blossoms with petals beginning to fall have stood 28 degrees F. No records are available as to the duration of these temperatures.

In other cases, blossoms with the petals falling have been killed by temperatures of 30 and 31 degrees F. It must be remembered in this connection that the almond blooms earlier than other orchard fruits and, therefore, is often subjected to much more severe frosts than occur during the blooming period of the later fruits. The greatest injury is likely to occur when a frost follows one or more days of warm weather. When the mean temperature both day and night remains low, frosts that might otherwise kill the flowers or setting fruit do no harm. This is what occurred in February, 1917, at the University farm, when repeated frosts at blooming time did not harm whatever.

In determining the desirability of a location in regard to its freedom from frost, the possibility of adequate air drainage is an important item. For this reason the lands along the lower foothills immediately above the floor of the valleys are ordinarily much less subject to frost—because the cold air is free to drain away to the lower levels. Generally the lands along the banks of streams which have been built up higher than the other lands of the Great Valleys through which they flow, are less subject to frost by reason of the natural flow of the cold air from them to the lower lands adjacent. For the same reason the planting of almonds in the lower lands of the valleys, no matter how large the valleys may be, should be avoided, unless the locality has been thoroughly tested for a long period of years and has proved to be an exception to the rule because of some peculiar situation with favoring air currents or air drainage, such as might exist near a natural draw in the hills where the settling of the cold air in some portions of the adjacent valley might be prevented. Such locations are generally confined to very small areas. Oftentimes an opening or draw in the hills may serve as an outlet for the



Courtesy College of Agriculture, Berkeley, California Harvesting almonds by knocking onto sheets spread on the ground.

drainage of much colder air from considerably higher elevations beyond, and then the danger from frost is very greatly increased. This is very common where canons act as drains to conduct the cold air from the high Sierras to the valleys below.

Variable weather conditions, and especially as regards temperature in the spring after growth commences, are highly undesirable. Warm weather immediately followed by cold tends to produce sour-sap, fruit drop and kindred physiological ills. Oftentimes crops have been lost where no frosts occurred after blooming commenced, simply due to sudden changes in the weather. However, it is highly probable that the greater portion of the trouble with fruit dropping, when of the size of peas or larger, is due to improper pollination. When the soil is not sufficiently well drained at such a time, the sour-sap effect is greatly augmented.

Humidity—Foggy or moist weather during ripening or harvesting is higly objectionable. The nuts do not dry out rapidly enough on the trees to prevent the growth of molds and consequent darkening of the shells. The nuts then require much heavier bleaching to brighten them properly for the demands of the market. The damp weather prevents the rapid and thorough drying-out of the kernel; the sulphur fumes are absorbed by the moist kernel and it sometimes becomes rancid before it is six months old.

Much damp weather in the spring encourages the growth of "shothole" fungus in the blossoms and fruit, often causing the loss of a considerable portion of the crop; the loss of leaf surface from the fungus infection is sometimes so great as to materially affect the vigor and vitality of the tree.

Rainfall—It is impossible to state any definite amount of rainfall which will or will not maintain the trees and enable them to bear regular crops of nuts. for so much depends not only on the variation in rainfall in different sections and in different years, as regards distribution throughout the year, but also on the time and intensity of the fall, the character of the weather following the rains and the ability of the soil to receive and retain the rain that falls. Ordinarily, however, with the above factors favorable, it is conceded that where the winter rainfall averages sixteen inches, almonds can generally be grown without supplementing the water supply by irrigation, if the orchardist exercises reasonable care to conserve the moisture for the use of the trees. Where the rainfall is inadequate some means of irrigation must be found to make up the deficit.

In some sections the annual rainfall varies greatly from year to year. Often it falls in such a way that a large proportion of it is lost in the surface runoff. In many places the soil is so leachy that it is incapable of holding sufficient water for the use of the trees throughout the summer, much of the winter rainfall being lost in the underground drainage. Under either of these conditions, 40 inches of rainfall might not

be sufficient. Very often winter rains are followed by desiccating winds so that a considerable portion of the rain which falls is lost by evaporation before anything can be done to hold it.

Continued rainy, damp and cold weather at the time of blooming is apt to sour the pollen or actually wash it away and thus prevent the fertilization of the blossoms, without which a crop is impossible. Bees and other insects are the principal means of accomplishing the pollination of almonds and such weather prevents them from working.

Soil

The almond is a deep-rooting tree and draws heavily upon the plant-nourishing elements of the soil. In ripening the large number of seeds which it is required to do, the tree must draw upon a considerable area of soil in order to supply the large amount of mineral matter that is needed to develop and mature the seeds. Analyses of almonds, as compared with other commonly grown fruits and nuts, made by Colby, show that the almond leads in the total quantity of mineral matters withdrawn from the soil. Colby further states that "The stone fruits fall much below the almond in total ash (mineral matter) excepting the olive, the ash of which, however, is largely silica (nearly eighttenths), an ingredient so plentifully distributed in all soils that it is of no pecuniary value." The table given illustrates this statement.

These figures suggest the necessity of having a deep, rich, well-drained soil for best results. For this reason and because of the deep-rooting habit of the almond, the soil should be at least ten or twelve feet deep.

Hardpan—Compacted substrata in the soil, whether they be hard clay layers or cemented layers of silicious, ferruginous or calcareous origin, are objectionable. They not only prevent the roots from foraging to a considerable depth as they normally tend to do, but they prevent proper drainage and aeration of the soil. If such layers are comparatively thin, that is, not more than two or three feet thick at the most, they may be shattered with dynamite so as to allow the moisture, air and roots to penetrate to the better soil below. Hardpan, therefore, should be avoided where it is too thick to be broken up or where it is not underlaid by desirable soil.

Humus—A plentiful supply of humus in the soil is essential. It not only improves the physical condition of the soil, but assists drainage, moisture retention and in rendering the plant food available in sufficient quantities for the use of the trees and for the maturing

of full crops of almonds. Many orchards have been very light producers year after year because of a deficiency of humus in the soil.

Drainage—The almond root is very particular as to its air and moisture requirements in the soil. It will not endure standing water in the soil for any length of time, especially during the growing season. Exclusion of air by excessive moisture is believed to be one of the most productive causes of "sour-sap." If allowed to continue for any length of time such conditions will cause the death of many or even all the roots and with them the top.

Water Table—A factor which is very commonly overlooked in connection with the natural drainage of almond lands is the position of the water table at different seasons of the year. Great care must be exercised in choosing a location to be sure that the water table does not rise during the summer. This is a very serious problem in many irrigated sections. Where the water table during the winter months is less than 12 feet in depth it is highly desirable to have as little fluctuation as possible: Where fluctuations take place at a greater depth than 12 feet they are not generally serious. The ideal condition is where the water table is highest in winter and quickly drops after the winter rains are over, to a depth of from 10 to 12 or 15 feet, remaining at that point during the remainder of the growing season.

The soil in addition to being well drained, must be sufficiently retentive of moisture to supply the tree throughout a long, dry growing season. If the soil will not retain a sufficient amount of the winter and spring rains, recourse must be had to irrigation to supply the deficiency.

Alkali—Alkali lands are unsuited to almond culture and should be carefully avoided.

In summarizing the soil requirements for almond culture, it may be stated that the ideal almond soil is a medium loam, uniform in texture, or nearly so, to a depth of at least twelve feet, well drained and yet retentive of moisture for the use of the tree during the summer. Fortunately some of the best almond soils are situated along stream banks where the land is relatively high, and is, therefore, less subject to frost. These streams flowing from the mountains and foothills have built up their own beds by the detritus brought from the hills. The coarser particles being deposited first and nearest the stream itself, make the better drained soils, while the finer particles and the clays, deposited further back from the bank Continued on page 40.

SOIL INGREDIENTS EXTRACTED BY THE ALMOND, AS COMPARED WITH OTHER ORCHARD TREES, AS SHOWN BY ANALYSES OF 1,000 POUNDS EACH OF THE CROPS IN A FRESH CONDITION.

		1	Phosphoria	c	
	Potash,	Lime,	Acid,	Total Ash,	Nitrogen,
	lbs.	lbs.	lbs.	lbs.	lbs.
Almond (hulled)	5.49	1.72	4.33	15.00	16.40
Almond (not hulled)		1.04	2.04	17.29	17.01
Walnut (hulled)		1.81	2.78	7.50	10.20
Walnut (not hulled)		1.55	1.47	12.98	5.41
Chestnut (hulled)		.71	1.89	8.20	8.00
Chestnut (not hulled)		1.20	1.58	9.52	6.40
Prunes (green)		.13	.53	4.03	1.48
Apricots (green)		.18	.71	5.16	2.29
Olives		2.32	1.18	94.63*	5.85

^{* 80.7} pounds of which is silica.

Dusting and the Spray Gun in Calyx Worm Control

By Leroy Childs, Entomologist and Pathologist, Hood River Experiment Station

EVER since the late Dr. A. J. Cook carried on some calyx worm control experiments in Michigan a half century ago entomologists have argued relative to the way and in the amounts this poison becomes established in the calyx cups. The correct type of nozzle and the kind of spray necessary to accomplish best results have been a much mooted question. In this connection some of our more enthusiastic colleagues have even gone so far as to believe that one well-timed calyx application would be sufficient to handle the codling moth under ordinary seasons of infestation.

Observations made by investigators in different parts of the country during recent years have pointed out that the percentage of calyx entrants is a very variable factor during different seasons in different sections. It has been the writer's observation that during some seasons a very high percentage of the worms enter through the calyx and during others the reverse would be true. During the past season the worms entered in about equal proportions through the calyx and side on Spitzenbergs, while in Newtowns, side entrants occurred in a much larger proportion. From information that I have received from various sources a condition of this sort was quite general throughout the Northwest during the past year.

It is not my purpose to in any way depreciate the importance of the calyx application in the minds of orchardists. The more stress that we can lay upon this and the cover sprays the better will be the results. However, overemphasis of the calyx application has been harmful in that it has had a tendency to depreciate (in the minds of the growers) the value of cover sprays and much worminess has been the result.

The writer has been keeping in very close touch with codling moth activities in Hood River for six years. During the past four years experimental work with dust and sprays of various sorts have been under observation.

The dusting method of applying arsenate of lead and sulphur to apples for the control of various insects and plant diseases created much interest following the publication of the work of Reddick and Crosby (Bulletins 354 and 369, Agricultural Experiment Station, Cornell University) in 1914 and 1915. The results of their work indicated that apple insects and diseases of importance in the East, other than San Jose scale and the various apple aphids could be controlled in about the same degree as with the liquid. In the West we have to add to this list of uncontrollable troubles, powdery mildew, anthracnose, and the leaf roller as well as a few minor insect pests. This fact places very decided limit upon the general utility of the method and makes it a means of general control that we cannot recommend.

The results of Reddick and Crosby

are especially interesting to me as I have been able to duplicate their results with scab and codling moth control during the four years of the investigation. To the entomologist working on codling moth control, these results should be decidedly significant. Reddick and Crosby do not go into the critical analysis of the proportions of calyx and side worms yet their good results indicate that they accomplished calyx worm control. How can the advocate of the so-called driving calyx spray explain this control? The writer's work shows that this control is very decidedly accomplished. The dust cannot be driven. Quiet air-atmosphere is the carrying medium used in placing the dust particles on the surfaces which require protection. A wonderful coating can be given a tree even to its uppermost branches. Upper and undersurfaces of the leaves as well as the fruit alike are covered. This air conveyor being in motion a slight breeze, very light, upsets the plans of procedure. A breeze makes it almost impossible to hit the tops and even if this

complish results. Several of our growers have used the dusting method; for the most part their work has been done regardless of air movement. In 1918 the condition of the fruit in one of these orchards was checked up; a 33 per cent injury from the codling moth was found. None of the growers of the valley have depended upon the system during the past year. On account of the many handicaps and difficulties encountered I do not recommend the method to our growers except those located on steep hillsides and in sections where sufficient water for spraying is difficult to obtain.

The results, however, that have been obtained in calyx worm control have a very decided bearing on the results that can be expected with the spray gun when properly used. For this reason I will discuss some of the results that have been obtained in seasons past with both dust and liquid applications. These results are summarized on the accompanying chart. In 1917 the unsprayed check trees in an orchard which had been quite wormy for several seasons,



Apple blossoms just after the falling of petals; best time to spray for codling moth.



Almost too late for the most effective treatment. Observe that the calyx cup is nearly closed.

were accomplished the particles are moved past the surfaces so fast that only a very small percentage sticks. The remainder passes on and is wasted for the most part. When the air is quiet these particles will hover for a long time over a tree and gradually settle. Air currents destroy the plan of the system and applications made under such conditions can only result in disaster.

In order to avoid windy conditions it was found necessary to dust very early in the mornings; a calm usually occurs in most sections of the valley during this period of the day. However, with us during the spring months it is not uncommon for a wind of varying degree to occur continuously for several days at a time. Many times in the carrying out of the experimental work the dusting had to be postponed for more favorable weather. We are all familiar with the fact that successful applications of spray cannot be delayed to any great extent and at the same time ac-

developed an infestation of 65.13 per cent. Of this infestation 31.68 per cent were side worms and 68.32 per cent were calyx worms. The variety used in this set of experiments were Arkansas Blacks. This ratio did not hold true in all varieties. In an orchard of Spitzenbergs this ratio was 66.96 per cent side worms and 33.04 per cent calyx worms. In a Newtown block this ratio was 61.54 per cent to 38.46 per cent side and calyx worms respectively. In the block of Arkansas Blacks two dust experiments were checked against two blocks of trees sprayed with twelve foot rods. In experiments number 1 and 3 an early September application was omitted, resulting in a much more wormy condition than occurred in experiments 2 and 4. These different experiments are cited to show, that regardless of this marked difference in worminess the general relation of side and calyx worms remains fairly constant, though with the increase in total worminess the chances of calyx

entrants also increases. The very marked difference between the figures obtained on the check trees as compared to both dusted and sprayed indicate the influences that are brought to bear in calyx worm control. Experiment 2 (dust) gave the best calyx worm control during 1917 where the ratio was found to be 92.99 to 7.01, side and calyx worms respectively. Experiment (rods) followed with an 80 to 20 ratio. The gun was not tested in this orchard in 1917. These blocks, as has been stated, were sprayed extra in Septem-The rods in the heavier infestation gave slightly better calyx control, 73.55 per cent being side entrants as compared to 71.6 per cent in the dust block.

Dusting work was not continued in the Arkansas Black orchard in 1918 but was continued in a block of Newtowns in a different orchard. As will be noted in experiment 6 the check block for this series of experiments developed a 17.64 per cent infestation. During this season throughout the district a greater percentage of side worms entered than calyx worms. The unsprayed checks developed 73.29 per cent side worms as compared to but 26.7 per cent calyx worms. However, regardless of this rather small percentage of calyx worms the difference of amount in calvx worm control is again pointed out in the results obtained. During this season calyx entrants were cut down to 5.2 per cent in the dust block. These results were checked against a block sprayed with a gun in the same orchard which developed but .44 per cent wormy fruit, and perfect control as far as calyx worm control is concerned. This work was continued in these same blocks in 1919, and though not presented on the chart gave the following The check trees developed results. 80 per cent side and 20 per cent calyx infestation. The figures in the dust block are 96.77 per cent side worms and 3.22 per cent calyx worms. The gun block, however, upheld the 1918 per-formance and developed not a single calyx worm in the apples counted. The figures look too good but nevertheless these are the ones obtained. At this point I might add that this orchard outside of the experimental work that has been conducted with dust, has been sprayed with a gun only since 1917.

Before being too firmly convinced of the relative merits of calyx worm control with dust and with spray gun a series of experiments were arranged in 1919 to compare the merits of the gun and rod in an orchard which had been quite wormy for several years. orchard which was chosen for this work suffered a loss of 20 to 30 per cent damage in 1918. In 1917 the loss was even greater. In the spring of 1919 many worms were found on the trunks of trees so there was no doubt but that there would be plenty of insects with which to work. Three blocks were chosen through the center of the orchard. One was sprayed with the gun throughout the season (experiment 10). Another was sprayed with twelve foot rods throughout the season (experiment 11). Experiment 9 gives the results obtained with the use of rods in the calyx application, guns being used for the other sprays. The varieties used in the tests were Jonathans, Newtowns, and Spitzenbergs. The trees were fifteen years of age. This discussion, presented in the accompanying table, with the exception given, includes the results obtained in the Spitzenberg block only. The spray was applied by the owner and his hired man under the supervision of the writer who followed behind the men while the trees were being sprayed in each application. Two guns were used.

This experiment, however, included the Newtown variety only. sprayed checks in this variety showed a much lower percentage of calyx worms, which naturally influences comparative ratios given in the table on a 31/2 horsepower outfit of well known make. The work was well done and well timed throughout the season. Five applications of arsenate of lead were used during the year; the last one, as the season finally turned out, was not very important. A summary of the results not only show that the gun held its own in obtaining codling moth control but gave better control than the rods and also where the rods were substituted in the calyx application that the calyx cups might be filled. The check trees developed an infestation of 53.6 per cent; the ratio of side to calyx worms was 45.16 to 54.83 per cent. In experiments 9 and 10 (rods in the calyx and guns in other applications) the percentage of calyx entrants was found to be practically the same, .34 and .35 per cent. The ratio of side to calyx worms being 85.74 to 14.28 per cent for the rods and 84.24 to 15.71 per cent for the guns. It is interesting to note here that the field control obtained by the owner two rows away from the check trees ran .56 per cent wormy, the fruit being checked up at random at harvest time. This demonstrates what can be done in a badly infested orchard in a season.

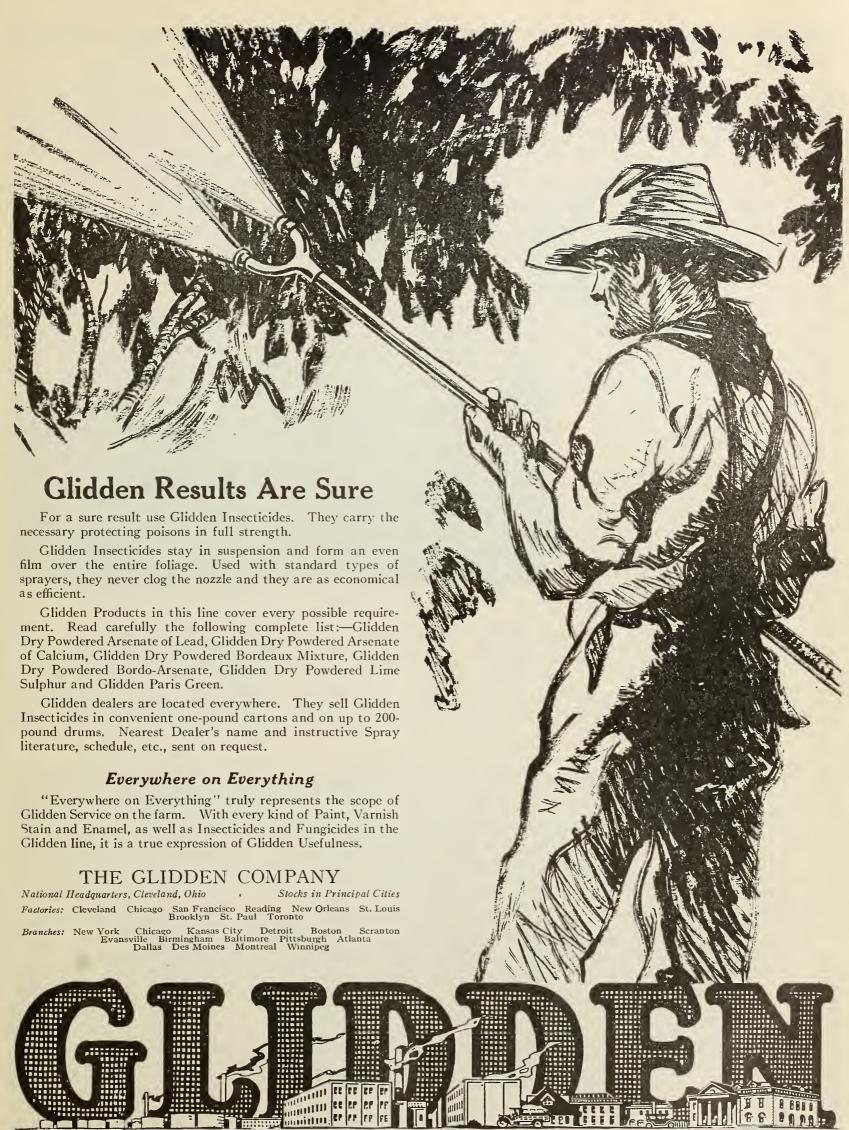
Another point upon which there is no experimental information available is the matter of worm control in the tops of large trees with the guns. At picking time the fruit was segregated in the different experiments in lots from the ground to 12 feet and from 12 feet to the tops of the trees (experiment 12 and 13). The trees in question were quite tall, considerable fruit occurring from 20 to 25 feet from the ground. Up to a height of 20 feet effective control can be obtained, above this point, however, effectiveness rapidly decreases. For example, in one tall tree 123 apples (which are included in the results given in experiment 13) were picked at a heighth of 25 to 28 feet and 22 of them were found to be wormy. The results indicate that calyx worm control in the lower portion of the tree is superior to that obtained in the higher portions of the trees, yet the ratio of calyx control does not fall far below that of the average condition. In this experiment apples taken at a heighth of 12 feet to the tops of the trees developed 81.13 per cent side worms and 18.86 per cent calyx worms.

From figures which I have been accumulating it appears that the codling moth is inclined to deposit more eggs in the tops of the trees than nearer the ground. It is quite important then that the fruit should either not be grown at that heighth or should be very well sprayed in order to reduce worm infestation to the minimum.

The poor results that have been obtained with the spray gun are not due to the principal involved in applying the spray. Unsatisfactory control can be the result of the misuse of one of three—or perhaps better—the combination of three misused factors. These are poor equipment, poor work and irregularity of application. Of the three factors the first mentioned is probably the most important from the standpoint of the use of the gun. The other two factors are contingent upon the first. The spray gun is a useless accessory on a poor spray outfit. It is little better than nothing and will never give good results. Our up-to-date 31/2 horse power sprayers are indeed too small to handle two guns effectively, they will handle one in good shape. A machine of this power, in order to throw a spray of the proper quality must maintain a pressure of at least 275 pounds. In the experimental work just referred to (orchard No. 4, table X) a machine of this character was used. In order to keep the spray in proper form it was tuned up and punished throughout the season. When you begin to punish a gas engine pump trouble begins, and the owner of this machine had his share. This condition of affairs existed in many orchards throughout the valley and was typical of no particular make of sprayer. A spray machine, in order to live the life that it should and at the same time deliver the goods must have a liberal reserve. A machine of 10 horse power is none too much. Such spray machines are now coming into use and it will be only a question of a very few years until all of the present so-called modern sprayers will go into the discard. The results given in orchard No. 1, table VIII, were obtained with one of these larger types of sprayers.

The gun where operated with small inferior equipment has given a very poor account of itself. I have carefully checked up the results obtained in several orchards where poor equipment has been used. The growers tried to do good work and timed their application well. Breakdowns and low pressure, which is usually the rule when a machine is not working right has led to very poor results. The lower fruits as a rule came through the season in fairly good shape. In 1918 in one of these orchards under observation the following records were made. Apples growing below 12 feet developed a worm infestation of 3.55 per cent. Apples growing between 12 feet and the tops of the trees developed an infestation of 17.63 per cent. There is only one explanation for this condition and that is the fact that the spray was not applied properly to the tops of the trees.

Continued on page 38.



The Department of Agriculture Cold Storage Plant

By Lon A. Hawkins, Plant Physiologist, Office of Horticultural and Pomological Investigation, Bureau of Plant Industry,
United States Department of Agriculture

THE ever increasing demand for foodstuffs has led to the development of various methods of pre-serving and storing fruits and vegetables in season for use when fresh products are not readily obtainable. One of the most important of these methods is that of cold storage, that is, the storing of fruit and vegetables at temperatures low enough to slow down the life processes but not inhibit them. By such treatment the life of a fruit or vegetable, which might be only one or two weeks after removal from the plant, may be lengthened to several months, with only slight deterioration in its food value and attractiveness.

The mechanical phases of cold storage, that is, the means of producing and regulating low temperatures, are fairly well understood. Much less is known, however, concerning the reaction of the various kinds and varieties of fruits and vegetables to low temperatures, though considerable experimental work has, of necessity, been done by commercial cold storages to determine the best temperatures for

the keeping of produce.

It was this dearth of information concerning the effect of low storage temperatures on fruits and vegetables that led the office of Horticulture and Pomology of the Bureau of Plant Industry to plan and erect a cold storage plant to be used for experimental work. This plant was designed with rooms large enough to give approximately commercial conditions of storage but not so large that the cost of operation and equipment for experimental purposes would be prohibitive. The plant was designed by Mr. S. J. Dennis, a refrigerating engineer formerly connected with this office.

The building is 100 ft. by 44 ft. on the outside and is two stories high, being 22 ft. from the top of the first floor to the plate. The exterior of the building is shown in figure 1. The walls and floors are of monolithic concrete. The gable roof is frame covered with fire proof shingles. The first floor of the plant, figure 2, is divided into engine room, storage space and handling room. The engine room is 26x42 ft. 4 inches inside, with an office about 10x12 ft. The ammonia compression system of refrigeration is used and

large tank of calcium chloride brine which is pumped through coils in the refrigerating chambers by means of a motor driven centrifugal pump. A gasoline engine connected to a two and a half kilowatt direct current generator furnishes power to drive the brine pump motor in case of interruption of the electric service.

The storage rooms are located next to the engine room. They are arranged in two rows of four rooms each (see figure 1) and open out into the insulated and refrigerated corridors which run along



FIGURE 1-View of the experimental cold storage plant.

the engine room is equipped with two twelve-ton belt drive vertical ammonia compressors run by 25 horse, slow speed induction motors. A forty horse power gasoline engine is provided for auxiliary power in case of accident to the electric equipment. Refrigeration is by circulating brine. The ammonia expansion coils are immersed in a

both sides of the building. The rooms are about 8x14 ft. by 11 ft. 7 in. high over all, furnishing in round numbers 1300 ft. of space. The rooms are insulated with insulation made up of flax fiber, mineral wool and a binder. Four inches of insulation were laid on the outside corridor walls and the same on Continued on page 36.

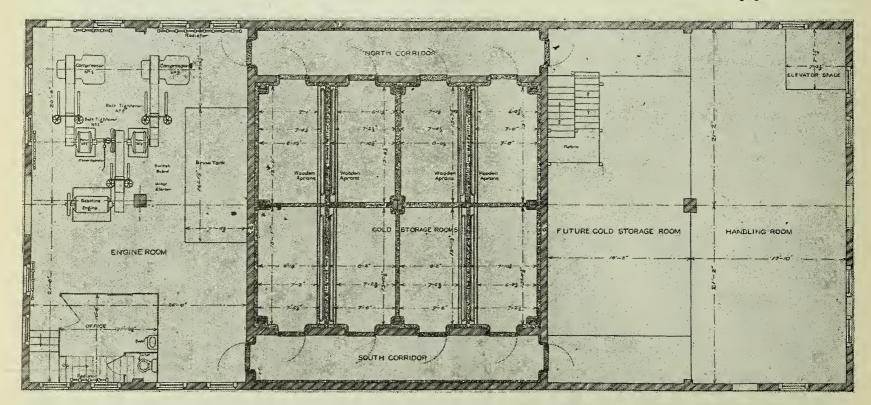
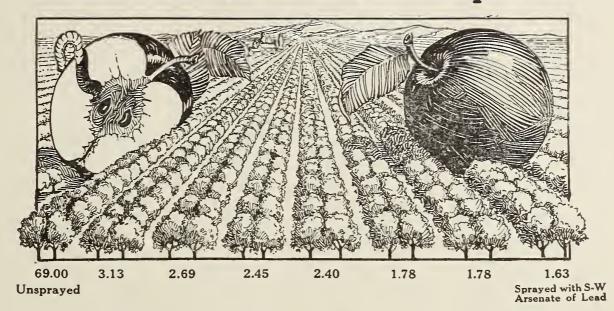


Figure 2—First floor plan of experimental cold storage plant, showing engine room, refrigeration chambers, unfinished refrigeration space and handling room.

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2 Unsprayed Rows showed 69.00% Wormy Fruit 2 Sherwin-Williams Rows only 1.63% Wormy Fruit

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Planting and Cultivating the Loganberry

By Britt Aspinwall

L OGANBERRIES are started from plants obtained by tipping the old vines in the fall of the year. The selection of plants in setting out a new yard is very essential, as a poor plant will make a weak vine, which will seldom, if ever, make much of a growth

or amount to anything.

We set our plants eight feet apart each way and cultivate them both ways during the first summer. This requires about 680 plants to the acre. Before setting them out the land should be put in first-class condition, then mark the ground both ways and take out a good shovelful of dirt for each plant, packing the loose dirt in around the roots with the hands so as to have them spread out as evenly as possible and keep them from drying out. We usually plant from the 25th of March to the middle of April, according to the season and the condition of the land. After the plants are set out they should be worked well each week or ten days during the summer with a disc harrow. springtooth and clodmasher to keep the ground loose and keep a dust mulch on the surface.

The vines will not make very much growth till about August, when they will begin to shoot out over the ground, and it will be necessary to turn them lengthwise of the rows and work the land only one way. At this time the holes should be dug and the posts set out for the trellis. We use good cedar posts, putting them not over thirty-two feet apart in the row and two feet in the ground. This makes a trellis five feet high. Anchor the end posts good, as there will be a heavy strain on the wires when they are filled with ripe

fruit. We use three No. 12 galvanized wires for the trellis, putting the top wire on top of the posts and the bottom one about 20 inches from the ground. In October the vines should be trained upon the trellis, spreading them out evenly so as to cover all the space possible and avoid bunches. It will be necessary to wind them around the wires but not too tight, and the top wire will carry the most weight. If more plants are wanted, train the vines over the wires with the ends down to the ground, and cover them 3 or 4 inches deep about the first to the middle of October. They will take root in the fall and winter and make good plants by the next March. We put ours down in this way and each year ship thousands of plants to all parts of the United States where they can be grown.

In the fall of the year plow the ground, throwing the dirt toward the rows, and leave it in this condition till spring. In the spring, as soon as the ground is in good condition to work, plow the dirt away from the hills, plowing very shallow closest to the rows so as not to disturb the roots. A vineyard plow is best for plowing the last two furrows, as one can get closer to the rows and between the hills with-out injuring the roots. It is a good plan to harrow close behind the plow if the weather is at all dry. This may be done either by hand or with a horse hoe. After hoeing them in good shape, which should be done soon after plowing, take a disc harrow and throw the dirt back to the rows, but be careful not to ridge them too much in the row, as it has a tendency to raise the roots

out of the ground. They should be worked with a spring-tooth harrow, or something similar, and a clodmasher every week or ten days during the summer and up into July. When the new shoots start in the spring they should be trained up in the center of the hills, allowing them to stick out over the wires unless they get too long, when they will have to be turned back. Never thin out any of the vines unless they get thick in the hills, as it is apt to bleed the roots. I prefer not to trim off the ends of the vines as we cannot see that they raise any larger berries, but fewer of them than when left as they naturally grow.

The picking season starts in from the middle of June to the first of July, and usually lasts about six weeks. It requires about four or five good pickers to the acre. As soon as we are through picking we cut out the old vines and train up the new ones, throwing the old ones between the rows, and cutting them up with a sharp disc harrow so they can easily be plowed under and serve as fertilizer. Loganberries should yield from one-third to one-half of a crop the next year after being set out, and thereafter a full crop. An average crop is from four to five tons of fresh fruit to the acre, although they sometimes yield as much as six and one-half tons on good, rich land. It requires five and one-half pounds of fresh fruit to make one of evaporated.

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Temperatures Which Will Damage or Kill Fruit Buds

By F. L. West and N. E. Edlefsen, of the Utah Agricultural College Experiment Station, Logan, Utah

EXPERIMENTS conducted at the Utah Agricultural Experiment Station, to determine the temperatures at which fruit buds receive injury from being frozen, are both valuable and interesting. These experiments were undertaken to assist growers in frost susceptible districts in the use of heaters in their orchards and also to know the drop in temperature necessary to cause the lighting of the heaters. Apart, however, from the value of this knowledge to the grower who may use heaters it is valuable to every grower to know what degree of frost will damage or kill fruit buds.

During the first two years that this work was being carried on the experiments consisted in removing branches from fruit trees and subjecting them to freezing temperatures in the laboratory. The damage done was then noted by counting the buds that had turned black and also the ones that were unaffected, and thus calculating the percentage of the buds that were damaged. As this method did not give sufficiently definite results, an apparatus was made for freezing the entire tree. The yields of the trees subjected to freezing temperatures were noted at harvest time after the buds on them had been checked up at the time of the freezing or shortly thereafter.

The apparatus for freezing the trees consisted of two double-walled half cylinders made of galvanized iron fastened to a wooden base that was put on runners, by means of which the apparatus could be moved by block and tackle or team from tree to tree. The cylinders were six feet high and six feet in diameter in the clear. Four inches of space was allowed for the ice and salt. When the iron cover was in place, ice and salt were spread over it and then canvas thrown over the whole to keep the heat out.

As the ice and salt took the temperature down, thermometers projecting through the sides showed the operator the approximate temperature inside the vessel. The temperature was modified by forcing varying quantities of air in at the temperature desired. This current of air, together with an electrically driven fan kept the temperature about the tree uniform to within a degree. Four standard minimum thermometers were hung at various elevations on the tree giving us accurately the minimum temperature attained and a thermograph also supported in the tree traced out the temperature changes as it cooled and then warmed up when the vessel was opened up, thereby giving us the rate of cooling and thawing. With this equipment trees were subjected to temperatures as low as 12 degrees Fahrenheit and by increasing the percentage of salt there is no doubt that temperatures still lower could be obtained.

In making these experiments check trees of the same size and kind with approximately the same number of buds and located near the frozen trees were selected. After the freeze, a certain percentage of the buds were cut open to observe the discoloration and the same percentage were destroyed on the check trees so that both trees were thinned equally. The yields of both trees were observed in the fall. To note whether it made any difference when the buds were examined, they were cut open immediately after the freeze and then at varying intervals afterward.

It will be of interest to make a little study of the theory of the injury to fruit buds due to freezing.

When plant tissue freezes water passes out of the cells and ice forms in the intercellular space. It has been found that if the thawing is done slowly enough when working with tender plants, such as lettuce and matured fruits, the water will gradually pass back into the cells, and if the original freeze did not rupture the cell wall, the plant has suffered little harm from the ice formation. If, however, the thawing is done rapidly, the water does not get back into the cells and they die due to drying out. We must have then either a rupturing of the cell wall when the ice is formed or else ice formation and in many cases rapid thawing in order to kill the tissue.

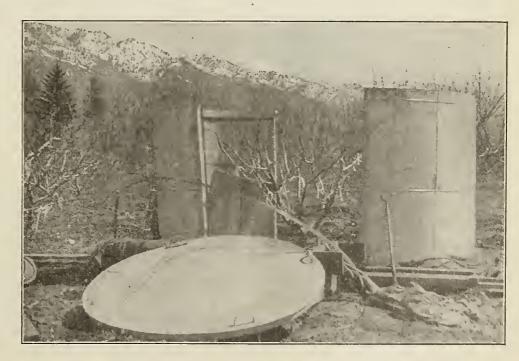
Pure water freezes at 32 degrees Fahrenheit. When substances are dissolved in it, the water freezes at a lower temperature, the amount of lowering of the freezing point depending on how much material is dissolved in it, and on the nature of the substance that goes into solution. For example, a five per cent salt solution freezes at 27 degrees F., while a thirty per cent sugar solution only freezes at 29 degrees F. W. H. Chandler measured the freezing temperature of the juice that he extracted from twigs taken from various kinds of fruit trees and found that on an aver-

age the sap froze at from 28 to 29 degrees F. and in no case did it freeze below 28 degrees F. The sap from Elberta peach twigs extracted in March froze at 28.7 degrees F., while but two-thirds of the twigs of the same kind of fruit when subjected in March to a temperature of as low as 10 degrees F. froze.

In the orchard it is frequently found that some of the buds withstand temperatures as low as 20 degrees F. and mature, and these buds no doubt take up these low temperatures as the work of Wiegend shows.

Fruit buds have a protective covering over them supposedly for the purpose of checking evaporation, but this is not sufficient to keep them for any appreciable length of time at temperatures different from the surroundings. Wiegend found as a result of experimenting with horse-chestnut buds containing thermometers which he sealed inside of them, that when these buds were subjected suddenly to a change in temperature of 20 degrees or more, in about ten minutes they had taken on the new temperature to within two degrees, and had arrived completely at the new point in a half hour. In case of the natural freezes in the orchard, where the temperature is falling slowly from sundown until sunrise, there is little doubt that the fruit buds take on the resulting temperatures of the surrounding air. In artificial freezing therefore it should not take long for the buds to acquire the new temperature, especially if they are in full bloom and when they are smaller than the buds used in the experiment reported above.

As was mentioned earlier, the more concentrated the aqueous solution the lower is its freezing point and in general the amount of the substance, especially if it be an organic one, that will



Apparatus used in freezing entire tree in experiments made at the Utah Agricultural Experiment Station. to determine the temperatures at which fruit buds are damaged by frost.

dissolve in water is but slightly affected by the substances that are already in solution. This allows the possibility of a very concentrated solution, and each of these substances has its influence in lowering the freezing point of the water largely independent of the others. For these reasons, rather a low freezing point of a solution is possible. A very concentrated juice, therefore, in the buds would be expected to freeze at a fairly low temperature. In spite of this, however, the unusual hardiness of some buds to freezing is really surprising. The difference in sensitiveness to cold of different buds on the same branch and of the same buds at different stages of development may be in part due to the difference in quality

and concentration of the cell sap. When liquids are cooled to their freezing points, if there be none of the solid material present, they rarely They may be cooled further freeze. several degrees and kept for days without solidification taking place. The introduction of as small an amount of the solid as one-hundred-thousandth part of a milligram is sufficient to cause freezing to commence. Enough solid will now separate out to raise the temperature of the whole to the melting point. The temperature now remains constant, and at the melting point until all of the liquid has become solid, the heat that is being lost by radiation being supplied by the heat that is always evolved when liquids solidify. In superfused liquids that have not been inocculated, crystalline nuceli make their appearance spontaneously at different points in the liquid and then begin to grow. The chance of these nuclei appearing increases with the quantity of liquid present and it has been found experimentally that liquids may be cooled far below their freezing points and maintained at these low temperatures for long times when they are kept in capillary tubes. In these tubes the rate at which these nuclei form and grow is sufficiently slow to be measured. The rate of growth is approximately proportional to the degree of superfusion when that degree is not very great and the number of nuclei formed in a given volume in a given time at first increases with the degree of superfusion, but afterwards reaches a maximum, and begins to diminish as the liquid becomes highly superfused. Liquids that have been very suddenly cooled far below their freezing points have been kept for months without freezing. The juice of the buds is confined in small capillary spaces and the above mentioned phenomena will help to explain in part the unusual hardiness of the buds and the great difference in hardiness of buds that appear to be very similar because they may thus be cooled below their freezing points and warmed again without ice forming.

A reading of the popular literature on the subject is likely to cause one to infer that buds have a certain freezing temperature, and that when they arrive at this temperature they all freeze. This, of course, is wide of the truth. There is a range of four or five degrees between the highest temperature at which two or three per cent of the buds are injured, and the temperature at which all the buds are killed. It should be remembered that on the same branch are often found buds that have swollen but slightly when others are in full bloom. A freeze or two in the early spring will usually do no harm; they simply serve to thin the buds out, for it is generally known that there are many more buds on the tree than actually mature into fruit. The number that can be allowed to freeze without heating the orchard will naturally depend on how many there happen to be on the tree at that particular time. It is very rare that a tree has so few buds on it that it cannot lose one-half of them and yet mature an average crop in the fall. Where we have endeavored to select a critical temperature we have taken it as near as possible to the point where not more than 50 per cent of the buds will be killed by experiencing the cold mentioned.

Some of the more important conclusions which will be of interest to the orchardist, arrived at by these experiments are as follows:

To kill plant tissue by freezing, either the cell wall must be ruptured when ice forms, or else after the ice forms, it must thaw rapidly. An occasional case of ice formation and slow thawing without death resulting to the tissue has been observed.

Fruit buds will stand a lower temperature by several degrees than the freezing point of the expressed sap, and the sap freezes at three or four degrees below the freezing point of pure water.

The literature on the subject might lead one to infer that the buds have a definite freezing point and that when the orchard reaches this temperature, practically all of the buds are frozen and the crop for that year is to be a failure. This is not the case. The orchard can usually stand two or three freezes without losing more than half of its buds, and this number is usually sufficient for a normal crop.

It doesn't make any difference, in the first two or three days, as to when the injury to the buds by direct observation of them is determined.

The further developed the buds are, the more sensitive they are to frost.

There is a range of at least five de-

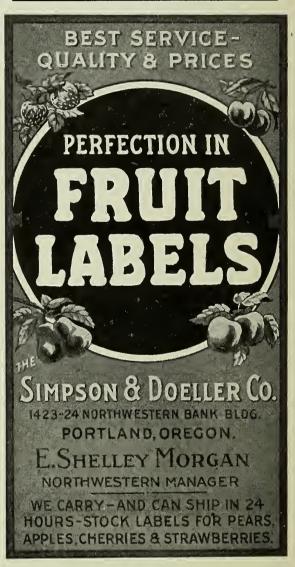
grees Fahrenheit between the temperature at which only about five per cent of the buds are damaged and the temperature that will kill all of them.

In the case of Double Nattie cherries when the fruit is setting, 29 degrees Fahrenheit caused no damage and 24 degrees killed practically all of them.

With Jonathan apple blossoms in full bloom, 28.5 degrees Fahrenheit caused no damage and 24 degrees killed about half of them.

Prune buds are slightly hardier than those of the other kinds of fruit that we tested.

The temperatures which will kill about fifty per cent of the buds of the Elberta peach are as follows: When they are slightly swollen, 14 degrees; when well swollen, 18 degrees; when they are showing pink 24 degrees; when in full bloom 25 degrees; and when the fruit is setting, 28 degrees Fahrenheit.



HOOD RIVER ORCHARD

One of Hood River's show places for sale. Thirty-three acres, all under irrigation; 22 acres in 18-year-old apples, mostly Spitzenberg and Newtown, with some Ortley and Jonathan; 4 acres in alfalfa. Regular producer, making good money. In the heart of the Pine Grove district, 6 miles from town on the new Mt. Hood loop. Local railroad stops on the place.

Exceptionally beautiful homesite. Ten-room modern house with every convenience except an electric elevator. Spring water under pressure and

Exceptionally beautiful homesite. Ten-room modern house with every convenience except an electric elevator. Spring water under pressure and electricity in all buildings. Barn and packing house, tenant house, family orchard, gardens, grapes strawberries asparagus equipment—everything.

orchard, gardens, grapes, strawberries, asparagus, equipment—everything.

Bank's appraiser puts the place at \$40,000. Sell for \$25,000 with terms.

My only reason for selling is that I want funds for development of my other 100-acre place. Write

RALPH ROOT, R. F. D. 4, Hood River, Oregon

Problems in Marketing Northwest Prunes

A Criticism, But Not A Knock

Editor Better Fruit:

STATEMENTS have been appearing in the press of late in regard to the uncertainty of marketing Oregon prunes and also that reports from the East are to the effect that California prunes are selling for 3 cents a pound more than the Italian variety grown in Oregon and Washington. I wish, therefore to say a few words about the marketing of Northwest prunes and although prune men in this section may not take kindly to what I say I assure you that my interest in the prune industry of the Northwest is sincere from a standpoint of pride as well as because of the financial phase; nor do I want to appear pessimistic, but there are some plain facts that should be known to every prune grower and packer in Oregon and Washington.

There was no mistake made in planting prune orchards as a commercial industry nor was it a mistake in planting the variety that prevails in the Northwest, but there has been a continual disregard of care in curing and preparing for the market.

When our orchards first began to bear in quantities for other markets, packing facilities were limited; knowledge of how to handle them was lacking, so they were graded, put into sacks and forwarded East.

The very nature of the Italian prune is such that it is impossible to handle it with any degree of satisfaction and safety in bags. This fact was soon discovered by the buyer after sustaining some substantial losses from rejections. Sales were hard to make. The growers took a hand in shipping themselves, but finding in some instances that they were called on to pay freight, aside from losing their fruit, they too were sorely disappointed. Something had to be done—so the method of pro-cessing was adopted; packing them in 25 and 50 pound boxes, eliminating almost entirely shipping in sacks. Since that time, which dates back about 15 years, some progress has been made but we are far short yet of marketing a satisfactory, safe pack of prunes.

The nature of the Italian prune is such that it must be processed in order to assure the dealer a commercial package that he can handle safely and a product that the consumer will buy.

I am not going to tell you how to dry prunes, because I don't know, but I do know that there has been a large tonnage of inferior prunes put on the market each year. Lots of them should have been condemned and destroyed. No one has the right to pick up and dry decayed prunes; some that have split and the cracks full of mould; others that have decayed from overripeness. Such fruit is positively unfit for food. The consumer does not know it, as its defects are covered up in the process of drying. It is even difficult for the packer to detect the imperfections; probably some packers do not look for them, so they are bought,

packed and shipped East and to Europe. Frequently they look all right when they arrive.

When under-cured and over-processed fruit starts up fermentation or mould, lots of it spoils on the dealer's hands and it is sold at reduced prices to the consumer. It is positively unfit to eat and is not liked and many times no reason is given for this dislike. Nor does the consumer actually know what is wrong, but I assure you that a trial of such fruit is enough. I will match with big odds an Italian prune against any other food product, either dried or in cans, for covering up its dirt, imperfections and filth. I can take a sound, properly cured prune and put it by the side of one that is partially decayed and dried and one looks about as good as the other, but cook them and try

them out by taste and the difference is noticeable—distinctly so. One is either rancid or sour and very repulsive, while the other has a sweet tart taste and is the most delicious dried fruit to be had. A well cured, well cooked Italian Prune served in its juice or with cream is in a class of its own—nothing to compare with it in the dried fruit line.

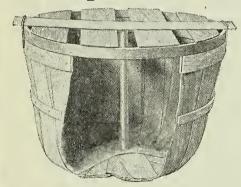
I wish every one of you could have been with me on a trip East recently, when I called on the jobbing trade in nearly every large commercial center. A portion of my time was given to investigating the situation as to Oregon and Washington prunes. I was more than disappointed; in fact, greatly humiliated—there were several thousand boxes of the previous year's crop in the New York market. They had rotted and moulded and had been worked over and were selling at 50 to 75 cents per box of 25 pounds. "Oregon prunes have



a black eye in this market," I heard everywhere I went. "How about orders for this season's crop?" "If they are cheap enough, we will try a few again," was the answer I received.

I have been in Oregon 25 years; I love the State; I am proud of it and I hold the highest regard for its resources. On my trip when talking with others I met in hotels, on the trains or in the business houses, I took great pride in telling them of our lumber industry, our grain, apples, and dairy products. I want to feel as proud of our prune industry as of these.

Protect Your Shipments



Universal Bushel Shipping Packages

safely marketed 10,000,000 bushels of fruits and vegetables last year. Ideal for all crops. Centerpost gives rigidity of barrel. Pick right into package. Pack in the orchard—save rehandling. Covers fit on without nails. Easy to lift, handle and load in cars. Write for information showing how hundreds of shippers prove they save money and get better prices and larger **net profits** by shipping in Universal Bushel Shipping Packages.

Valuable Facts Free

Write for handsome free booklet "Shipping Profits"—filled with information of vital interest and profit to every fruit and vegetable shipper.

Package Sales Corporation

106 East Jefferson Street South Bend, Indiana We have produced in the last few years about 125 million pounds of dried prunes. During the same period, California has produced many more million pounds. Our packing facilities and selling ability are far greater per ton than California. Now with the small tonnage and ample marketing resources, our fruit has gone to the consumer at a much less price than theirs. This fact is evidence that something is wrong. It's true that the general demand is for a sweet prune. It's also true that there is a demand for a tart prune and this section grows them.

I want to make it clear to you that something must be done immediately. The prune acreage is increasing materially, both here and in California. France, Bosnia and Servia are factors in the industry. I predict that unless our fruit is cured and packed so as to increase the demand, you will see some pretty cheap prunes within three years.

I will admit that the Italian prune is more difficult to cure and pack than a sweet variety. It can be done; it has been done, but enough poor fruit has gone out to prevent progress for the past five years. If every dryer in the Northwest had taken from his orchards only sound, ripe fruit and cured it properly, then properly processed it, we would not have half enough prunes to supply the demand and at as good a price per pound as any district in the world gets.

We will never succeed as long as half ripe, split, mouldy and decayed fruit is dried and then possibly not packed properly.

The manufacturer or any one producing or preparing anything for food, who has not observed the rapid growth of sanitation and marked development of cleanliness in the past few years, is falling far short of the times. People are particular about what they eat and they are going to be far more so in the future. Laws are doing much in this respect; a campaign of education for better, cleaner food is prevalent everywhere. Many canners, packers and manufacturers of food supplies invite public inspection. I visited one large plant East that required the services of three guides to take care of the visitors, each guide taking from ten to twenty-five people on a trip through this plant. It pays to be clean. Would it increase

It pays to be clean. Would it increase the demand for our prunes if the public were invited to visit our prune dryers and packing houses when in operation? Have you any doubt about extending the invitation? There should be none.

In closing I want to say that the prune industry is going to progress. We are going to have better fruit. It will be one of the best paying industries we have. Commercial principles governing the demand for our prunes will in time correct abuses heretofore mentioned, but let us not wait until compelled to do something that we should voluntarily do ourselves. Let us all work together for a better Oregon and Washington prune.

Are You the Man?

If so, Better Fruit offers you a chance to make good money

We want a representative in every fruit-growing community. In every such community there is some individual with a little time each month to spare, who, by representing Better Fruit, can make a good income.

Perhaps it will be an elderly man?

A young fruit-grower just getting started?

A wife who wants to help out?

An ambitious boy or girl who wants to make extra money?

We want someone in your community to become our permanent representative—to secure new subscriptions for us and renew old ones.

We want two or three representatives in the Hood River Valley. Several in Yakima and Wenatchee—in the Willamette Valley, Rogue River, etc. In fact we want permanent representatives in every fruit district of the West.

Our proposition is a good one. Are you the man or woman for the job? Write today, stating your qualifications.

BETTER FRUIT PUBLISHING COMPANY

OREGONIAN BUILDING, PORTLAND, OREGON

Using Bees to Best Advantage During Flow

By George S. Demuth, Agricultural Assistant, Bee-Culture Investigations

BROOD rearing, which is of primary importance during the preceding period, becomes of secondary consideration at about the beginning of the honey flow, because this is nearing the limit beyond which time the resulting bees develop too late to take part in gathering and storing the crop of honey.

At this time therefore, there is a radical change in the purpose of the manipulations. Instead of continuing the expansion of the brood-chamber the policy of the beekeeper should now be rather a concentration of the workers and the brood. There is perhaps a limit to the number of workers that profitably can be kept in a single hive and set of supers, but this limit is seldom reached, the usual mistake being in having too few. Each colony should have its brood-chamber well filled with brood in a compact form and be so crowded with young and vigorous workers that they will immediately occupy the supers when the honey flow actually begins.

The brood-chambers of colonies occupying more than one hive body should at this time be reduced to one, any extra brood being used in colonies having less than one brood chamber full of brood. After this operation, should there be still some colonies left with the brood-chamber but partly filled with brood, they should be filled with combs of brood and adhering bees (without the queen) draw from some colony or colonies too weak to work well in comb-honey workers.

This massing of the workers in strong colonies, so essential to the production of a fancy grade of comb honey renders necessary extremely careful and skillful management since the efforts of the beekeeper may be nullified in two ways:

(1) The bees, by swarming, may divide their forces into two or more parts, neither of which would be ready to work in the supers until the season is much advanced or perhaps closed entirely, or (2) being defeated in their

efforts to swarm or from lack of convenient storage space, etc., they may do very poor work even during a good honey flow simply because the conditions of the colony are such that the storage instinct is dominant.

To bring about the best results in comb honey, the entire working force of each colony must be kept undivided and the means employed in doing so must be such that the storing instinct remains dominant throughout any given honey flow.

Any increase made before or during the honey flow is made at the expense of the surplus honey unless it be made with brood that would emerge in time for the young bees to be of use during the honey-flow. In general, however, increases may be made at a much less expense by setting aside some of the colonies for that purpose. To keep the forces together and satisfied with the storing instinct dominant during a good honey-flow is the most difficult problem with which the producer of

Swarming-Preventive and Remedial Measures.

comb honey must deal.

Colonies do not all behave alike as to swarming. (1) Certain colonies go through the season with apparently no thought of swarming. Such colonies do the very best work in the supers, and their numbers can be increased by skillful management. (2) Other colonies start queen cells preparatory to swarming, but can be persuaded to give it up by such mild measures as destroying the queen cells and other methods devised, but not extensively used by producers. Among these methods are fitting the sheet of foundation in place, then directing a fine stream of melted wax along its edges, or the use of split sections in which a sheet of foundation is continuous through a row of sections, extending through their sides and top.

Some super-construction is such that the sections may be placed directly in the super by the operator who puts in the foundation. This work is usually done during the winter months when the bees require no special attention. Enough supers should be provided to take care of the largest possible crop, even though it is not often that all are used the same season. The beekeeper who is operating several apiaries cannot afford to take time to prepare supers for the bees during a good honeyflow. Supers of sections thus prepared in advance should be kept clean by storing them in piles and keeping the piles covered with dust.

Tree Planting

Editor Better Fruit:—Every spring and fall some trees are planted. Many trees will be planted this spring and again many more will be planted this fall. To get the best results from our labor it must be done right. The oldfashioned way of planting trees is fast being replaced by one that is more modern and gives better results. Each year many trees are lost by not doing it right. Making a hole and sticking a tree in it is not planting trees. Of the trees that were planted this way, many died the first year or never started to sprout.

Apple Boxes

HIGHEST QUALITY WESTERN YELLOW PINE

If you wish to make sure of a supply of well made boxes at fair prices, let us place your orders.

Carloads Only

Spokane Fruit Growers Co. SPOKANE, WASH.

NOW is the time to send to

Milton Nursery Company MILTON, OREGON

FOR THEIR 1919 CATALOG. FULL LINE OF NURSERY STOCK.

"Genulnenes and Quality"

Steam Hot Water Vapor and **Exhaust** Heating

Sanitary **Plumbing**

Central Heating **Plants**

How Much Did YOU Lose?

What did the freeze cost you, Mr. Grower?

The day of the old wood stove is past. Do not leave your valuables unprotected any longer, but take steps NOW to safeguard your crops.

Let us tell you how to heat and ventilate your packing house properly.

Dauch Heating & Engineering Co.

Specialists in Heating and Ventilating Installations East End Burnside Bridge

PORTLAND, OREGON

Engines Blowers Fans Motors Compressor **Pumps**

Steam and Plumbing **Supplies** Radiators The person usually blamed for the trees not making a healthy growth, is the one who sold them, and in 90 out of 100 cases it was not his fault.

Not long ago I sat on a rail fence watching a man punch holes into the ground on my neighbor's place. At first I thought he was making holes for small posts, but on inquiring I found he was making bore holes, to blast holes for trees. I was interested and wanted to see the holes after they were blown. He told me that the next day he would shoot them. He was early on the job. I went over and examined some of the holes and on measuring found them to be two and one-half feet deep, and the hardpan penetrated. The blaster prepared the shots, then loaded all the holes. He used 25 per cent dynamite and went about it in this way: He cut the fuse in lengths of three feet, inserted the end of the fuse in the de-tonating cap and crimped it. He then made a hole in the stick of dynamite and inserted the cap, tying it securely to the dynamite. After he had all the sticks primed he started to load the holes. The dynamite was shoved down to the bottom of the hole with a broom handle and fine earth thrown in on it. Earth was put in the hole and tamped with the broom handle until the top of the hole was reached. He loaded all the holes and thein started to fire them. I examined the holes after they were shot and found them to be about three feet wide and three feet deep. (By three feet deep I don't mean that the earth was blown out to the extent of three

feet but that the earth was loose to that depth.) He took out all the loose earth from one of the blasted holes and found that the subsoil was busted, (I use the term busted because in it I find I can exactly say just how it was.) The blaster being through with his work went home. My neighbor called his men and they started to plant the trees. There were only 45 to be planted, so it did not take long.

One man went ahead and dug out the holes. He made two piles of the earth. One pile was the topsoil and the other the subsoil; the neighbor and the other man did the planting. The topsoil was thrown into the hole until the right depth was reached; the tree after being pruned to a whip was set in the hole and the balance of the topsoil was firmly packed around the roots; on top of this was thrown the subsoil. On top of this a dressing of well-rotted manure was placed. I asked my neighbor the why for all this and he remarked, "The use of dynamite cracked that subsoil so that it will be impossible for the tree to die from lack of moisture. The young tree takes this moisture by sending its fine rootlets into this subsoil, thereby insuring it of a steady growth. The placing of the topsoil at the rootsystem, gives the fine roots a chance to get into the mellow earth; they could not do it so easy if they were stuck in the subsoil.'

Regarding the cost he said, "The cost was a little more, but what is the use of planting a tree and not have it grow? Plant it right at the outset. By hiring

a blaster I could keep my men at their regular work until the trees were actually to be planted. The planting was done in half the time as with pick and shovel, and I am well satisfied."

Five months after these trees were planted I went over and examined them. The growth was fine, in fact wonderful for five months' growth and that, in my estimation, is the best monument to good preparation and care in planting. F.A.K.

Fruit Trees Good Investment.

The ordinary individual craves a certain amount of fruit in his diet. On the average farm fruit constitutes only about 6 per cent in value of all food consumed. The percentage could be increased to good advantage, making fruit a more important part of the diet, says the United States Department of Agriculture.

A small area of the farm devoted to apple trees, peach trees, berry plants, or other fruit suited to the region, is a good investment for any farmer.

Demand for Spray Material Heavy.

The demand for spray material in the Northwest is the heaviest this year ever known and includes all classes of sprays. The demand is credited to the excellent propaganda that has been carried on by the experiment stations and agricultural colleges and also on account of the prosperity that has come to the fruit grower during the past two years.



KILL THE PESTS

This man is Dusting twenty acres per day at a cost of less than one-half cent per tree, using the

American Beauty Dust Sprayer

> Codling Moth Red Spider Curculio Aphis Caterpillar Mildew, Etc.

Write us about it.

California Spray Co.

6001-29 Pasadena Ave. Los Angeles, Cal.

The Value of the Different Roots as Stocks

By W. L. Howard, Deciduous Fruit Station, Mountain View, California

THE great shortage in nursery stock this planting season has caused an unusual amount of discussion about the value of different roots as stocks for deciduous trees. This year nurserymen were able to sell almost everything they had. In the past year there has been a slight demand for prunes on roots other than myrobalan. Every year a considerable acreage of prunes is planted on peach and almond stock. A few have, for various reasons, desired to have prunes on apricot roots. Many have inquired explicitly about the value of this stock for French prunes. We have very good evidence to show that apricot is not a safe rootstock for the French, although it seems to be safe enough for sugar prunes, and possibly for some other varieties. The French, however, makes a very poor union with the apricot root, and in the case of one orchard recently examined near Gilroy, the trees are rapidly breaking off at the age of five and six years. Other instances have come to my attention where the trees became much older than this before breaking, but eventually they do "pinch off." Some old orchards in Napa County where Imperial prunes were top-worked on Royal apricots many years ago are still in good condition. At the same time French worked on the Royal was a failure. Many growers have told me that sugar prunes do well on apricot root. Sugar prunes, on the other hand, make a very poor union with the peach, and should not be used for that purpose. Some plums behave similarly on the peach, the Diamond being a conspicuous example. Owing to the propaganda during the

last three or four years in favor of the Japanese pear as a rootstock, nursery-men have almost stopped using the French stock. Indeed, I am told that the large growers of seedling stock in Kansas and elsewhere have almost ceased to grow the French pear stock. The wide use of the Japanese pear stock has been advocated because it is so much more resistant to pear blight than the French stock, and further-more because it has been found to very successfully resist attack by woolly aphis. Wherever pear blight is prevalent, there is no question that the Japanese stock is much safer to use than the French stock, although it is not wholly blight resistant by any means. In the coastal region, particularly in the Santa Clara Valley, where pear blight is no problem, there has always been considerable discussion as to the advisability of giving up the French stock, which has been thoroughly tried out and found to be satisfactory in every way, except that it is injured by woolly aphis. The big question in the bay region, especially in the lowlands adjacent to the southern end of San Francisco Bay, is to know whether the Japanese pear root will withstand as much water in the soil as the French. In that particular region, the woolly

aphis is said not to give much trouble,

even to French stock. One nurseryman who furnishes considerable stock for the region under discussion thinks that the growers there should stick to the French pear stock by all means, but he complains that, on account of the general condemnation of French stock, it is now becoming almost impossible to procure it.

Undoubtedly a rootstock entirely resistant to blight will eventually be found. At the present time it is known that some of the Siberian seedlings give great promise; certain strains of varieties are, for all practical purposes, undoubtedly blight resistant, but the problem is to isolate these resistant strains

from closely related forms that are not resistant and get them in sucifficent quantities to place them within the reach of all nurserymen and growers.

A few growers have been able to start trees that were blight resistant so far as trunk and the bases of main branches were concerned by benchgrafting long scions of the Surprise pear on Japanese roots. These grafts were planted deeply, so that the scions in most cases formed roots. If the resultant nursery trees are planted in the orchard so that the Japanese root is six or eight inches underground, there is practically no danger of sprouts arising from the seedling stock. The Surprise pear makes a fine, shapely tree, and is a vigorous grower. It is entirely safe as regards attacks from pear blight. The Surprise tree may be shaped up in the

DOW

DEPENDABLE

Spray Materials

are now available in virtually every important consuming section in the United States and many foreign countries.

This justly famous line is the product of one of the largest chemical manufacturers in the world, and every known modern device is necessary and is employed in the manufacture of—

Dow Powdered Arsenate of Lead
Dow Powdered Magnesium Arsenate
Dow Powdered Lime Sulphur
Dow Paste Arsenate of Lead
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The Dow Spray Calendar and name of the nearest distributor will be sent free upon request.

The Dow Chemical Company

MIDLAND, MICHIGAN

GROWERS' AND PACKERS'

EQUIPMENT

Labor Saving Devices for Handling Fruit and Vegetables

Automatic Elevators, Sizers, Box Presses, Box Making Benches, Ladders, Packers Supplies.

Write for catalog.

Price Manufacturing Co. Inc. Yakima Wash.

No Orchard or Farm is Complete Without Our Latest Model

All Purpose Evaporator

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HOME EVAPORATOR CO. ST. LOUIS, MISSOURI

P. O. Box 817

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Are You Going to Build A Drier?

See me before building.
I can save you money.
\$20 gets blue prints complete.
I run six tunnels to one stove.
Have right ideas of size of air chamber and proper radiating surface.
Dried 82 tons of prunes at a total cost of \$16.50 per ton.
Every drier my type is a success.

EDWARD DENCER

R-3, Box 158

SALEM, OREGON

desired manner and the main branches top-worked to Bartlett about the third year. Many have asked if the Bartlett makes a safe union with the Surprise. All that can be said on this point at the present time is that four or five years of growth have shown no evidence of weakness.

Liming Soils

Farmers of acid soils have often wondered why liming increases the yield of crops on some acid soils and does not on others. Investigations by the Oregon Agricultural College experiment station chemists have developed the fact that increases may be expected wherever the calcium forms combinations with humus bodies.

Since the composition of the soil solutions is a governing factor in plant growth, the effect of lime on the composition of these soil solutions may be an index to the inconsistent action of lime acid soils, says the report of the chemists. The solutions from various acid soils were analyzed at successive intervals after liming with calcium carbonate, calcium oxide or calcium sulphate.

The analysis showed that nitrates increased in those soils that respond to lime treatment, large quantities of soluble potassium were caused in all soils treated with calcium sulphate, the calcium content remained nearly constant whatever the treatment, soluble phosphorus decreased slightly under all treatments, and sulfo-fication occurred in all soils responding to liming. Alkalinity was present in soils treated with the carbonate and oxide forms, while acidity was present in untreated soils and those treated with the sulphate forms.

These findings fortify the soils department findings that drainage of wet lands and incorporation of organic matter in rundown lands should precede extensive liming. They do not indicate any lessening of the use of lime, but do go far to establish the soundness of Dean Cordley's recommendation that every farmer of acid soils conduct lime experiments to see whether his soils will respond, and then govern his orders for lime accordingly.

Bush Fruit Culture.

If a currant or gooseberry plantation is properly cared for, at least eight to ten crops may be expected before it becomes unprofitable because of its age. Productive fields over twenty years old are not uncommon in some sections. Although the number of years a plantation will continue in good bearing condition depends to some extent upon location and soil, the most important factor is the care which it receives. The period of productiveness of both currant and gooseberry plants is longer in northern regions than towards the southern limits of their culture and longer on heavy soil than on sandy soil

Providing More Money for Higher Education

The splendid advance of progressive agriculture in Oregon as well as agricultural education and higher education in general, is threatened with a serious check unless the relief prayed for in the Higher Educational Tax act, to be voted on by the people of Oregon at the special election May 21, is granted.

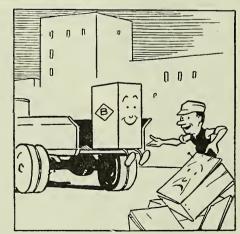
The results of extensive research work by the experiment station at the Agricultural College, Corvallis, and the seven branch stations representing the peculiar climatic and soils conditions of the seven agricultural regions of the state, have been rapidly brought into intimate touch with the farmer through the extension service. The practice of these results in production and protection of farm crops, livestock, dairying, poultry raising and farm and soil management have increased tremendously the production of high class produce and at the same time tended toward reduction of production costs.

Rapid as has been this extension of scientific agriculture, it has scarcely kept pace with the growth of college attendance—a growth in which the State University has shared. Rising living costs, the costs of equipment, buildings, supplies and instruction have climbed continuously throughout the war and reconstruction periods, while the funds for support of the institutions and the research and extension work have remained about stationary in nominal proceeds, but in reality have shrunk about 100 per cent in purchasing power

In view of these emergencies the college and the university and normal school have joined in asking for an additional 1.26 mills for relief, and the matter has been referred to the people by the legislature to be passed upon at the special election in May.

The boxes on this terrible ride
All gapped a joint or split a side;
Did we say all? Well, all but one—
The B-D box finds riding fun.

Your goods are safe when packed in **Bloedel Donovan** super-strong boxes.

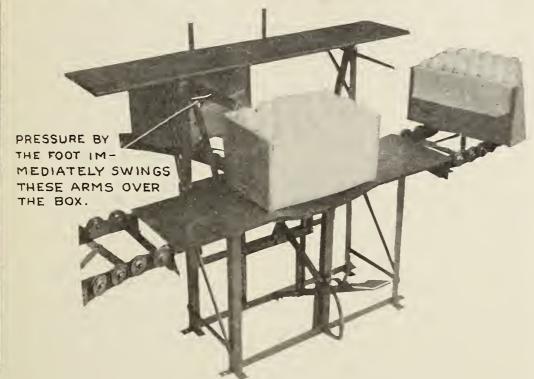


Sawed right, carefully graded, skillfully built and delivered promptly.

BLOEDEL DONOVAN LUMBER MILLS 1020 White Building, Seattle, Wash.

Douglas Fir, Western Cedar, Hemlock, Spruce, Red Cedar Shingles

The Cutler Box Press



Quickly adjustable for apple or pear boxes. Never out of order. Will not rack to pieces.

Here is the all round durable press you have been looking for. The CUTLER BOX PRESS is strongly built of steel and will last many seasons of hard usage.

There are no arms or parts above the box to interfere with folding the lining paper or placing the lids. A light touch of the foot brings the presser arms into position.

Couplings are provided for gravity carrier bringing boxes in from either side and for the lidded boxes out through the back. No need to lift the boxes. They slide easily on the smooth metal top and tip over onto the carrier to the rear after the lid is on.

The presser arms are connected with an equalizer bar which evens the pressure at the two ends of the pack.

IF YOU WANT ONE OF THESE PRESSES GET YOUR ORDER IN.

The Cutler Fruit Grader

Is recognized as the leading fruit grader on the market today and is used in hundreds of packing houses in the United States, Canada and foreign countries.

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BETTER FRUIT

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Better Fruit Publishing Company

703 Oregonian Building PORTLAND, OREGON

Why Not Confer?

It is proposed that the various large fruit handling organizations of the Northwest hold a conference for the purpose of discussing matters in relation to fruit marketing that are of importance to both grower and shipper. The main object of this conference would be for the purpose of making an agreement to establish a burean of information or a system by which each of these organizations would supply daily reports of the movement of fruit shipments that are being distributed from Northwest points. Other matters would no doubt be taken up at such a conference that would result in beneficial action.

Taking into consideration the handicap under which most of these organizations have been working during the past season, and other seasons for that matter, in competing for sales in the big markets, it would appear that if such an agreement could be made that there would be many advantages. The kind of fruit shipments that this system would more particularly apply to would be apples, the tonnage of which in the Northwest is increasing so rapidly that a coöperative scheme of marketing, if only on a limited basis, is very essential.

Fruit growers in the Northwest must wake up. They must be brought to realize that they must leave no stone unturned to keep the markets they have for their fruit, and to create new ones, for the big part played in this year's apple market by the fruit from the Pacific Northwest is causing the apple growing sections in the East and the Southwest to discuss the adoption of methods that are expected to give the fruit of those sections the preference.

A conference of the fruit handling organizations of the Northwest looking to the adoption of improved marketing methods is not only, as we have said, essential, but a necessity.

The Call of Education.

Now that the legislature of Washington has done its duty in the matter of providing additional funds for public education it remains for the voters in Oregon to keep pace with its sister state in keeping the torch of enlightenment bright and burning.

The measure to provide the Oregon Agricultural College, the University of Oregon and the State Normal school with additional funds will be voted on in Oregon at the primaries May 21. All of these institutions need the relief in the way of money asked for and the public needs the greatest efficiency they can render in the several branches of education in which they specialize. Larger classes, causing a need for enlarged accommodations and more equipment, more instructors and increases in salaries to retain these instructors, owing to higher living costs, are among the vital things that make additional incomes for these institutions necessary.

As the fountain head from which flows the stream that leads to the higher things in life no public spirited Oregon voter will ignore this call. Oregon citizens must go on record as as progressive in the matter of education as the bordering states of California and Washington if they expect their state to forge ahead. With every progressive educational movement in these states being pushed they cannot afford to lag behind.

Cull Apples and Cider.

Reports from several sections of the country are to the effect that cider making plants that last year paid growers many thousands of dollars are going out of business or are being put to other uses because they cannot comply with the government regulation prohibiting the manufacture of any kind of fruit juice that contains over one-half of one per cent of alcohol. Therefore the prohibition law that seemed to be a boon to the apple grower is in reality a black eve.

The question now arises what is to be done with this grade of cull apple which is unfit for any other use. If the law is strictly complied with it cannot even be made into vinegar as the chemical action that takes place in the process between cider and vinegar exceeds the alcoholic content many times. Boiled cider, which is an attenuated form of apple butter, is not very highly relished as a beverage and other attempts to rob the pure juice of the apple of its slightly sparkling content and then market it, have not made anybody

There seems to be but one hope for that old-time refreshing drink of our ancestors, and that is to have the law governing its alcoholic content modified. Considering its usually non-intoxicating qualities this should not be hard to accomplish for even a Maine or Kansas senator ought not to object to cider.

Information on Storage.

Experiments now being conducted by the United States Department of Agriculture in a specially constructed government plant to investigate diseases and other reasons for the deterioration of fruit in cold storage should result in the saving of thousands of dollars and also the more scientific management of plants for storing fruit. With a movement on foot to greatly increase the storage of apples in the Northwest and other sections of the country information of this nature will prove highly valuable.

While excellent results have already been accomplished in this line by the experts which the government has placed in the field the proper storage of fruit is a question the average grower and shipper needs much information on. Heretofore storage has been a part of the apple industry that has been left to a large extent to buyers and shippers. From now on, however, it is apparent that the grower from the standpoint of self-protection intends to add storage to the other phases of the fruit industry and with this in mind will welcome complete information on this question.

Order Early.

From present indications it will be well for the fruit grower who has anything in the way of equipment and supplies to purchase to make arrangements to obtain them well in advance of the time they are needed. This advice applies to almost every appliance, material or thing of any kind necessary for an orchard or fruit farm. Manufacturers are already giving notice that they are experiencing difficulty in supplying retailers and the latter state that the demand is far in excess of the present supply. So order early if you would not be caught short handed as the season advances.

What the Papers Interested in Fruit Are Saying

According to The Fruit World, published at Melbourne, Australia, the quantity of apples that shippers wanted to export from that country to England during the present season was 1,600,000 bushels. The English government, however, which was providing the ships for the transportation of the fruit cut down the space for shipments to 750,000 bushels. The result was a number of indignation meetings and severe criticism of the government's action. Of the total quantity booked for shipment by the growers, Tasmania produced 800,000 bushels, Victoria, 400,000 bushels, West Australia, 350,000 bushels and South Australia, 50,000 bushels.

W. M. Yundt, who owns an apple orchard near Peshastin, Washington, has the distinction of having grown the largest apple in the United States in 1919. It was a Wolf River variety, measuring nineteen inches in circumference and weighed two pounds, ten ounces!

—Monthly News Letter, Washington State Department of Horticulture.

Prcliminary estimates of the tonnage of dried fruits in California tend to show more than 400,500 tons were handled in 1919 as compared with 265,700 in 1918. Raisins, 184,000 tons, constituted the largest variety. There were 135,000 tons of prunes, 35,000 tons of peaches, 14,500 tons of apricots, 11,000 tons of figs, 10,000 tons of apples and 5,000 tons of pears. The biggest increase was in prunes, the production having almost tripled that of 1918. The apricot yield was 500 tons lighter than the preceding year.—The Evaporator.

Are our agricultural colleges and experiment stations incapable of solving fertilizer questions in relation to the orchard? There is now an amazing lack of accurate and satisfying data and information on the subject. Experts on orcharding and specialists on fertilizers themselves testify to the apparent apathy of experimental institutions in this respect. At the November convention of the Ontario Fruit Growers' Association, Prof. F. C. Sears, of Amherst, Mass., said that the agricultural colleges had done less in the matter of solving orchard fertilizer problems than in solving any other problem of either orchard or farm. Mr. Henry G. Bell of Toronto, who knows as much about fertilizers in general as any man in Canada, said to the association: "I am convinced that one of the things that is holding back your net returns from orcharding in this province is a lack of specific information regarding fertilizers."

In studying fertilizer problems, experimenters seem to have chosen to follow the lines of least resistance. They have fled from the complex fertilizer problems of the orchard to other fields where results are more certain and more immediate. There have been very few long-continued experiments anywhere in Canada or the United States to ascertain, for instance, what the fertilizer requirements of the apple are, but long-continued experiments with fertilizers on field crops are numerous.—

Canadian Horticulturist.

Canadian Horticulturist.

Pear Culture at Home and Abroad

By C. I. Lewis

FOR a number of years there has been a steady increase in interest in pear culture in the Pacific Northwest. This interest is due to a number of causes. One of these is that California developed the pear industry until it became the leading state in the Union in the production of this fruit, while the Rogue River Valley in Southern Oregon has become noted the world over for the high class pears which it produces. Again, there is the fact that while many states are planting apples very heavily, statistics show that very few states are giving the pear any attention, consequently more and more growers are favoring the pear above the apple. Pear culture in Europe has for a number of centuries attracted a great deal of attention. In fact the pear has in the past received, and is now receiving, more attention than the apple. In the early part of the last century Van Mons, the Belgian plant breeder, attracted world-wide attention by introducing a large number of new pears. The blight, which is the greatest scourge of the pear in this country being an American disease, was unknown to the Europeans.

The French have contributed more literature on pear culture than any other nation. Thousands of varieties are described by such men as Du Hamel, Decaisne, Le Roy and Mas. Many of these works give colored plates and very full descriptions of varieties. The early American books gave a great deal of space to pear culture and described many varieties of pears. During that period of American history when nurseries were few and far apart and the farmers planted seed for their orchards, many new varieties of fruit originated. During this epoch our leading varieties of apples were produced, and likewise many pears. Such varieties as Howell and Seckel are of American origin. During the early part of the last century the blight was raising such havoc among the orchards that pear growers were becoming very much discouraged. This gloom was brightened somewhat, however, by the introduction from Europe of the leading varieties of pears, and our American pomologists like Barry, Downing, Thomas and Warder became decidedly enthusiastic over these importations. The pears that were introduced into this country in the early days were of the European blood (Pyrus communis). A little later some of the sand pears (Pyrus cinensis) were introduced. They attracted, however, very little attention because the quality of the fruit was about equal to that of a raw potato. However, they hybridized with the former and as a result the Kieffer and later hybrids were produced. These hybrids were not so susceptible to blight and they extended pear culture southward, as the Oriental pear would stand warmer climatic conditions than the European pear.

What is the present status of pear culture in this country? Investigation

will show that only two or three states are gaining in acreage, a few are barely holding their own, while the great majority are losing ground. We find the pears of pure European blood succeed best where the trees make a moderate growth, and where the combination of climate and soil produces a firm wooded and hardy tree. For the Eastern States, New York, New England and Michigan seem to offer the best conditions for successful pear growing, and on the Pacific Coast California, Western Washington and Western Oregon are especially adapted for the production of this fruit. Those regions of the Pacific Coast that have rather warm climatic conditions during the growing season and must depend largely upon irrigation, will be able to grow pears only by using the greatest care in retarding the growth of the trees. The blight will probably always be a problem, but scientific methods of control will doubtless go a long way towards making pear culture successful in such regions. Concerning the growing of such pears as the Kieffer many of the Middle Western and Southwestern States are growing this variety successfully.

In choosing a location for a pear orchard the ideal conditions will be, first such climatic factors as produce slow growth; second, good air drainage so as to reduce the frost damage; third, the selection of congenial soil, and fourth, the planting of well adapted varieties. Having favorable climatic conditions and good air drainage, the question of the adaptability of the varieties to the soil is one of the most important factors. It has long been known that certain varieties of pears will grow on very heavy land—on land that is too heavy for apples. This has led many people to believe that any marshy or swampy land, which their farm contains, which is unadapted to any other crop, will grow pears successfully; and while it is true that some varieties of the pear will grow on very heavy land, it is essential, however, that this soil be drained if best results are to be hoped for. Standing water on the soil is not conducive to the best vigor and growth of the tree.

The question of variety and adaptability is largely a local one, and it will be some time before each community can satisfactorily answer this question. The Bartlett seems to be a variety which adapts itself to a great many conditions, growing well on many soils, from the heaviest to the lightest. The Bosc is doing well on heavy soils. The Howell, while doing well on some of the lighter loams, is showing indication that it will do even better on heavier soils. The Winter Nelis requires a strong, rich soil and prefers the moist loams to the dry, light loams. The Anjou and Comice seem to prefer lighter loams, although many fine Anjous are gathered from rather heavy soils. Here in the Pacific Northwest very few varieties of the pears are being grown. The Clairgeau is about the only variety not mentioned that is being grown commercially. There are undoubtedly many varieties of pears which will succeed with us. To the pear grower I would suggest that he try a few varieties that are not now commonly grown, advising, of course, that the experiment be on a limited scale. Among the pears that I would advise him to look up and experiment with are Glout Morceau, President Druard, Duchess Bordeau, Forelle, Santa Claus and Charles Ernest.

The question of stocks to use is one which is largely in the experimental stage. Up to very recently our nurserymen were using what is known as the French seedling stock almost exclusively. This is of Pyrus communis blood. Recently, however, many Pacific Coast nurserymen are discarding this stock and are using the sand or Japanese pear. The reasons are that the French stock is attacked by the root louse, whereas the sand pear is not, and the latter is also more resistant to the blight. Where dwarf pears are to be used, the Angers Quince is the best stock. The Portuguese can be used, however, to good advantage where the climate is The quince should be very mild. worked to either Koonce or Angouleme, and these in turn are worked over to whatever varieties are desired.

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The distance for planting pears will vary from twenty-two feet to thirty feet, according to soil and climate. Many varieties of pears are sterile and do not set fruit well with their own pollen. The Comice comes in this class, and the Anjou sets fruit poorly with its own pollen. In fact even with self-fertile varieties I would recommend planting so as to secure cross pollenation. I would suggest two lists, early bloomers and late bloomers. For Oregon, the early bloomers are Bartlett, Clairgeau, Anjou, Howell, Kieffer; late bloomers, Angouleme, Bosc, Comic, Easter, P. Barry, Winter Nelis. Any two early bloomers or any two late bloomers will inter-pollenate satisfactorily. Plant from two to six rows of a variety, as they will produce more economical than mixing them in rows. In an article of this length it is impossible to go into all the details of pollenation, soil treatment, pruning etc. The care of the soil is about the same as that given for apples. The open type of tree is the more approved form, as it is believed it is easier to fight blight with such a tree than where the central leader is allowed to remain. Care should be used, however, in starting the trees to get the main branches well spaced. The greater the distance between the branches the better. Should the blight get into the crotch of a tree, where the branches come from one point, the tree will become greatly weakened. After the trees come into bearing, moderate annual pruning should be the rule. It is believed by some growers that the Anjou will stand more pruning than some other varieties. Summer pruning will be beneficial in overcoming the tendency of some varieties to bear on the tips of branches.

Practically all Pacific Coast pears are being boxed, and by the use of precooling, refrigeration cars and cold storage the season of most of our varieties of pears has been greatly lengthened. Howells and Comice keep until Christmas and Anjous until February. The export trade in pears is of considerable importance and our best trade in England will be for Christmas pears. Late winter pears will have to compete with South African Bartletts which reach English markets about the last of January. The canning of pears has become a tremendous industry and the planting of Bartletts for canning factory use, when conducted on a commercial scale, is proving a very satisfactory business.

There is a splendid opportunity to increase the consumption of pears. A campaign of education is necessary. For example, the Bosc pear is very little known, yet its quality is superb. But because of its unattractive color and form it is not a good show-stand fruit. When once known, however, it becomes very popular. There is no region in the world that can surpass the Pacific Coast in pear production. The quality is unexcelled and the flesh so firm that it stands shipping well. With such an asset we should be able to increase the consumption of pears very materially in the next decade.

WHEN WRITING ADVERTISERS MENTION BETTER FRUIT

Northwest Fruit Notes from Here and There

OREGON.

Owing to the fact that pear growers in the Rogue River Valley, Oregon, are being offered \$45 per ton for their pears for canning purposes this year the California Pear Growers' Association is advising the Oregon growers not to sell at that figure as indications are that canning pears will bring a much higher price. A telegram recently received at Medford from California advised the local Chamber of Commerce that buyers in the latter state were offering \$85 per ton for the same stock that they were trying to buy in Oregon for \$45. It is freely predicted at Medford that canning pears will sell for \$100 per ton before the season is over.

The fact that several million pounds of the 1919 crop of prunes remain unsold is causing operators in the prune industry considerable uneasiness, according to newspaper reports. This large amount of holdover stock is expected to affect the price of the new crop of prunes.

A fruit ranch sale of interest recently took place at Medford, when Lieutenant O. V. Morrow purchased Brookhurst, the large place formerly owned by E. B. Pickel, near Medford. The ranch, which consists of 153 acres, 60 acres of which are in pears, 6 acres in apples and the rest in barley and alfalfa sold for \$45,000. The entire acreage is under irrigation and is considered one of the best producing fruit farms in the Medford district.

According to E. M. Harvey, research man for the Oregon Agricultural College, who has been inspecting orchards in the Willamette River and Rogue River Valleys to determine the extent of the damage winter injury from frost, the damage is comparatively slight. In a recent statement Mr. Harvey says: "Greatest injury is noticed in the lower and central sections of the Willamette Valley. In these sections the damage was due to the fact that trees have not properly reached a dormant state of growth and were thereby more susceptible to injury from frost. The Upper Willamette Valley and Columbia Basin came through almost intact as the trees were in a better state of dormancy." An optimistic view of conditions in Southern Oregon is held by

Professor Harvey. Only a few isolated trees show fatal injury. No extensive damage is reported from the commercial orchards of the Umpqua and Rogue River Valleys. "In the Willamette Valley the discoloration of cambium tissue on south side of trees just above snow line caused alarm to fruit growers. This discoloration has cleared away in many cases and a vigorous growth has set in which would indicate the ultimate recovery of the trees."

Although the orchards in the Hood River Valley were hit a little by the severe cold weather in December, reports from that section are to the effect that strawberries came through in good shape and a fine yield and an early crop is now expected. Buyers for canneries are already reported to have been in the Hood River Valley offering 14 cents per pound for canning berries. canning berries.

The Umpqua Valley Fruit Union located at Roseburg, which is winding up its apple shipments for the 1919-1920 season has shipped 150 cars of apples. The acreage of apples coming into bearing in this district is fast increasing and the next few years will see a large tonnage being shipped from this point. The plantings in this district are in fine condition and the apples being produced are of most excellent quality.

That the fame of the loganberry has reached Canada was shown in a recent purchase at Salem of 40,000 tips which will be set out in British Columbia. The tips were bought by L. Chelvally, superintendent of the Borden Milk Company's plant at Sardis, B. C. Mr. Chevally, who owns a large acreage near that place will set part of it to loganberries.

Fruit growers in Lane County, near Eugene, are contemplating setting a large acreage to strawberries. The section that has been picked out for the new planting is known as Lower Fiddle Creek, where the soil is said to be especially adapted to this berry. In order to give the fruit growers of this district better transportation facilities the county authorities are preparing to build several miles of highway to reach the railroad direct. Canning berries in the Eugene district brought as high as 15 cents per pound last year.

The Phez Farms Corporation, a company connected with the Phez Company of Salem, is setting out 30,000 strawberry plants this spring. The planting is being done on a large acreage recently acquired in what is known as South Bottom. The varieties being set ou are the Wilson, Trebla and Ettersburg.

The Hood River cider and vinegar plant recently completed its apple crushing operations for the season. The season's run was the heaviest in the history of the plant, the amount of fruit made into cider and vinegar approximating 10,000 tons.

Reports from Salem, the center of the logan-berry industry, are to the effect that buyers are offering still higher prices for these ber-ries for the coming season. Offers of 15 cents per pound were recently reported from that section with only a few contracts made at this price. The high figure is said to be due to the fact that the crops in many of the berry fields will be cut down by the injury from the freeze in December.

Britt Aspinwall, one of the heaviest producers of loganberries in the Willamette Valley, reports having received orders for 500,000 plants this spring. The orders for these plants have come from all sections of the Pacific Coast and although the price has jumped to \$50 per thousand, buyers are reported to be eager to buy them even at that figure.

The Phez Company of Salem, recently contracted for an acreage of strawberries from the place of C. W. Swallow, near Oregon City for \$160 per ton for 1920 and \$140 per ton for the crop in 1921. Several other contracts of this character are reported to have been made in the Oregon City district.

The announcement is made that Frank Moore of Walla Walla, Wash., who owns an apple orchard in the Upper Hood River Valley will soon commence the construction of a modern packing plant and storage house to handle his increasing apple crop. The building will be constructed of concrete and will be three stories high. In the upper story there will be accommodations for the help needed at harvest time. harvest time.

FEATURES

Compactness

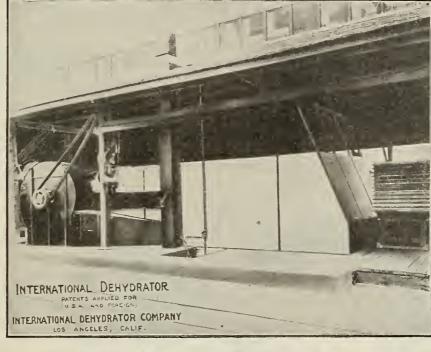
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LOS ANGELES, CALIFORNIA

With 24,000 acres of fruit signed up by the Oregon Growers' Coöperative Association, the management of the organization is now turning its attention to providing the plants necessary to handle the tonnage during the coming season. While no amouncement has been made as to just where these plants will be located as yet, the officers of the association have under consideration tentative plans which are expected to be put into execution shortly. are expected to be put into execution shortly.

An innovation that is causing considerable interest among fruit men in the Medford district is the announcement of the installation by the Bardwell Fruit Company of two box making machines. These machines are the first of this kind to be installed in this district and will have a capacity of 2,000 boxes per day. The Bardwell Company is establishing equipment in its plant which it expects to almost entirely do away with hand labor in packing fruit. The equipment consists of a Cutler grading machine, Doig box nailing machine and a Matthews gravity conveyor system.

WASHINGTON.

WASHINGTON.

Fruit growers and others interested in the better transportation of fruit and produce from the Wenatchee district are much encouraged over the outcome of a meeting recently held at Wenatchee to consider the proposition of building a railroad from that district to Pasco, to connect with the transcontinental lines which touch that point. At the meeting which was held under the auspices of the Wenatchee Commercial Club, 25 per cent of the cost of the road was pledged by Wenatchee citizens. With this amount of the cost of building the road assumed by popular subscription it is believed that the remaining amount necessary can be taken care of by issuing bonds. As planned the first link of the road, which would follow the Columbia River would extend from Wenatchee to Beverly, where it would connect with the Mil-

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waukee railroad. Ultimately, however, it is planned to extend the road on to Pasco. The amount considered necessary to build the road is \$5,000,000. It is proposed to raise \$500,000 of this amount among the citizens of Northern

In addressing a meeting of 200 berry growers recently at Seattle, J. L. Stahl, horticulturist at the Western Washington Agricultural Experiment Station, advised prospective berry growers not to put all their fruit in one basket, or in other words to diversify. In this connection Mr. Stahl said: "If I had ten acres of land and was going into berry growing I would not devote it exclusively to one fruit. I would plant a variety. On the gravelly spots I would put in strawberries, in the light soil red raspberries, and in the heavier soils loganberries or blackberries. Occasionally, even in this favored country some crop will fail, and if your berry crops are diversified you will fare better."

In District No. 4, Mr. Darlington reports some damage to stone fruits, apricots and peaches showing the most injury, but he looks for a normal crop of apples. In the Yakima section, District 5, the conditions range about the same as in District No. 3. In some peach orchards we find a very large per cent of live buds, enough to warrant a good crop, while in others the conditions are quite the reverse. Pears were also injured in some parts of the Yakima country, as well as cherries. In the sixth district, the prune section of the state, Mr. Fletcher reports a slight injury to the prune crop, but believes that under favorable conditions we have reason to expect a reasonable crop of prunes. In other counties on the west side, where we find the principal bush fruit interests, there is evidently some injury to the loganberry canes which were left on the trellises, but those which were left on the trellises, but those which were still on the ground show but little injury. Mr. Huff has reported some damage to the raspberry canes, but he cannot tell the extent of it at this time.

At the annual meeting of the Yellow Pine Box and Lumber Company at Yakima, a report of the business for last year showed that 600,000 fruit boxes were manufactured and delivered and that all preferred stockholders received boxes at 13 cents a box. The company paid 8 per cent dividends to preferred stockholders, besides making a substantial surplus earning. Between 800,000 and 1,000,000 boxes will be manufactured this year. A limited portion of the output is now being sold to preferred stockholders at 23 cents per box.

The loading of apples in box cars for shipment cast has been started in the Wenatchee district, and in the opinion of local shippers this method is the only one that offers any hope for moving the crop. Arrivals of empty refrigerator cars continue to be at a low ebb, only about 10 or 12 cars a day being received. Total shipments to date amount to 10,632 carloads of apples, leaving nearly 1500 cars still to be forwarded.

Plans for four new apple warehouses, to cost from \$10,000 to \$20,000 each, to be erected this year, have been favorably considered by trustees of the Spokane Fruit Growers' Company. The company contemplated the erection this summer of warehouses at Grant Orchards, Greenacres, Coeur d'Alene and Sunset. The proposed warehouses will have storage facilities for 40,000 to 80,000 boxes each. They will be frame construction with filled walls. The company's experience during the cold spell of last December was that fruit withstood the extreme weather better in such warehouses. They can be made ready for the 1920 crop. The erection of a fruit storage warehouse of several hundred cars capacity at Otis Orchards by the Earl Fruit Company, as an addition to the company's packing and storage plant already there, is being considered.

Indications are that Yakima cider plants, which annually pay growers of the valley in the neighborhood of \$75,000 for cull apples will go out of business this season and the plants be converted to other uses. Operators declare it is impossible to manufacture commercial cider which will not develop an alcoholic content in a short time exceeding the lawful amount.

A new cold storage warehouse of four stories and a capacity of 800 cars of apples, in addition to space for the storage of a vast quantity of other perishable food produce, will be erected in Spokane at an approximate cost of \$600,000. J. W. Turner, manager of the Arctic Cold Storage and Warehouse Company, is heading the project and it is supported by the allied interests of Spokane, including the Earl Fruit Company, the Spokane Fruit Growers,

G.L. Davenport Grower and Shipper

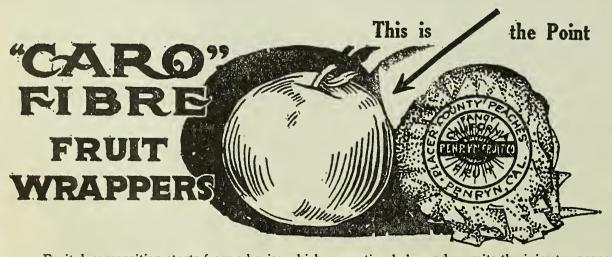
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MAIN OFFICE 147 Front Street, PORTLAND, OREGON

Nice Bright Western Pine FRUIT BOXES AND CRATES

Good standard grades. Well made. Quick shipments. Carloads or less. Get our prices.

Western Pine Box Sales Co. SPOKANE, WASH.



Chemically Treated "Caro" Protects

"Caro" from DessiCARE (to dry up)

"Caro" **Prolongs** the Life of Fruit Why?

Fruit decomposition starts from a bruise which opens tiny holes and permits the juice to escape and BACTERIA to enter. "Caro" clings closely and dries up the escaping juice. "Caro" ingredients harden the spot, kill the BACTERIA, arrests the decomposition—and thus **PROLONGS THE LIFE OF FRUIT.** If your fruit is worth shipping it is worth keeping in best condition.

Demand "CARO"—Wrap Your Fruit in "CARO"—The Fruit Buyer Knows; "CARO" Order from Any Fruit Company or American Sales Agencies Co., 112 Market St., San Francisco the Northwest Fruit Growers' Exchange and individual capitalists. The plan is to form a new company to absorb the present Arctic Cold Storage and Warehouse Company, an established concern of many years' standing, with its miscellaneous cold storage business, consisting of butter, eggs, beef and other food products. This will be Unit C in the final plant. The building will be of reinforced concrete, four stories, with a foundation capable of bearing four more stories later. It will be modern in machinery and equipment and as first constructed will have a capacity of 800 carloads of apples at one time in addition to other products. When four more stories are added its apple capacity will be 1000 carloads. There will be 45,000 square feet of space to each floor and a total of a million and a half cubic feet of space. It is proposed to start work on the building so that it will be completed in November. This territory produces 20,000 cars of apples annually, but shippers cannot consign to Seattle for cold storage because of the back haul rates.

The Price Manufacturing Company of Yak-

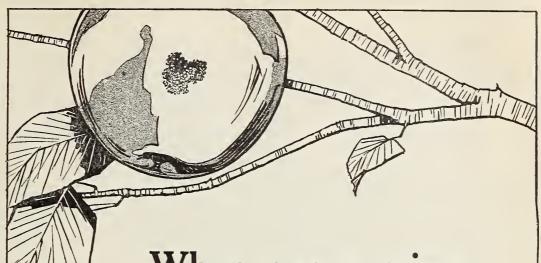
The Price Manufacturing Company of Yakima, is the name of a new company which has taken over the manufacture of the Price fruit sizer and other packing house equipment. The members of the new firm are A. W. Richter and C. A. Palmer. Mr. W. G. Price, who was the inventor of the apple sizing machine that bears his name will be retained by the new company in an advisory capacity. Mr. Richter, who is president of the new concern, is a graduate of Cornell University, having specialized in mechanical engineering. Mr. Palmer is a graduate of Whitman College and has been instructor in chemistry and physics at the Yakima High School for several years.

In commenting on the outlook for the fruit crop in the State of Washington for the coming season, M. L. Dean, chief of the division of horticulture of the Washington State Department of Agriculture, summarizes as follows: "It is impossible to tell the exact extent of winter injury to the stone fruits and bush fruits until growth starts. Hence, pruning of the soft fruits should be very carefully done so as not to destroy any prospective fruit buds. Beginning with District No. 1 in the vicinity of Walla Walla, our present observations are that along the Snake River territory, there will probably be about a 50 per cent crop of peaches and apricots, cherries running from 75 per cent to 90 per cent. In the vicinity of Clarkston there is little evident damage at the present time. In the Walla Walla section proper, there is not enough damage to perceptibly affect a normal crop. In the second district in the vicinity of Spokane we find some damage to pears and cherries, but no serious injury to apples. In the Kettle Falls country, Stevens County, the temperatures ranged below 20 and these is considerable damage in sight, especially to the stone fruits; pears are injured somewhat in that territory. In the third district, the lower Yakima country, the injury is spotted. There are places where the cherries and peaches seem to be practically all killed, with some blackening of the pear wood and evident injury to the bud, but in other places the damage is very slight and there is a promise of a 50 per cent crop. The apples do not show any serious injury."

IDAHO.

IDAHO.

The addition of an entomologist, an assistant dairy specialist, and an assistant in rodent control to the staff of specialists of the University of Idaho Extension Division is announced. These, with the sheep specialist, whose employment was announced a little more than a week ago, will bring the number of specialists to twenty-three. Besides these, the federal predatory animal inspector for Idaho has taken offices with the extension staff and will work in coöperation with extension workers. Claude Wakeland of Fort Collins, Colorado, who has been assistant state entomologist for Colorado, is the new extension entomologist. He will begin his Idaho employment April 1. He will take up the fight against the alfalfa weevil, the codling moth, the grasshopper, cricket and other insect pests. One of his methods of fighting the weevil will be to demonstrate the use of a power sprayer on a Ford auto truck, a system which has been employed in Colorado. Propagation of parasites to destroy the weevil also will be undertaken. Other extension specialists who will be connected with the horticultural work of the University are: F. B. Hitchcock, soils specialist; E. R. Bennett, field horticulturist; B. F. Sheehan, field agronomist and state seed commissioner; C. B. Ahlson, assistand field agronomist; Jessie C. Ayres, state seed analyst; Claire Hobson, assistant state seed analyst.



When one survivor breeds a thousand enemies

> —you can't afford to spray with untested preparations or chemicals of unknown quality. One surviving codling moth, for example, lays from thirty to a hundred eggs. The hatched larvae soon develop into moths and produce a second generation — often a third brood may form in a

> Use only chemicals of proved strength and merit, and mixtures approved by state and federal experimental stations.

> > Grasselli Grade Specialties Arsenate of Lead Paste and Powder Calcium Arsenate Lime Sulphur Solution Bordeaux Mixture Sulphate of Nicotine

are time-tested products, made and backed by a firm 81 years old in the chemical field.

It will pay you to specify Grasselli Grade when ordering your spray materials. You will find Grasselli Dealers handily located in every fruit and farming section.



The Grasselli Chemical Co.

Founded in 1839 Cleveland



INJURY FROM FRUIT TREE PESTS

E TERNAL vigilance, and the prompt application of the most reliable and effective spraying materials is necessary to insure a profitable crop.

Some people may be able to afford gambling on some things, but mighty few fruit growers are willing to risk a crop failure by taking chances on spraying materials.

Our appeal is to the thoughtful fruit grower who fights shy of unsupported claims, and demands to be shown. It is to him who if he were reiging him, who, if he were raising live stock would own full blooded sires; or if corn, would see to it that the seed was perfect.

To such fruit growers we offer Orchard Brand Dry Powdered Arsenate of Lead as a crop and tree protection. It has been proved effective. Its results are known. We shall be glad to give you the names of many successful fruit growers who are enthur fruit growers who are enthusiastic about its results.

Suggestion: Write for the booklet. Also write for Bulletin No. 3 on Dormant Spraying of Deciduous Fruit

Other spray materials, for specific purposes, we recommend are:

Orchard Brand Dry Powdered Arsenate

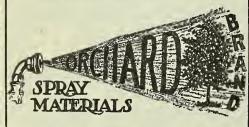
of Lead.
Orchard Brand Arsenate of Lead,
Standard paste.
Orchard Brand Atomic Sulphur
(patented).

Orchard Brand Bordeaux Mixture paste.
Orchard Brand Powdered Bordeaux
Mixture.

Orchard Brand Lime Sulphur Solution.
B T S Dry Sulphur Compound (patented).

Orchard Brand Weed Killer.
Universal Brand Dormant Soluble Oil.
Universal Brand Miscible Oil.
Universal Brand Distillate Oil Emulsion.
Liquid Whale Oil Soap.

Our interests are the same as yours. Write us about your tree troubles.



General Chemical Company

770 Royal Insurance Building, Dept. A San Francisco, California

Timely Topics and Advice for Fruitgrowers

As the spraying season is at hand it will be well to beware of the man who offers to spray your fruit trees for a few cents a tree. According to reports made on this question by various experts who have conducted experiments to determine the cost of spraying orchards it costs from 50 to 60 cents per tree to spray trees that have reached an age of 15 to 18 years with four sprays. Therefore it will be the part of wisdom to avoid the man who offers to spray your orchard at a very cheap figure. cheap figure.

If you are contemplating buying nursery stock do not go into the deal with your eyes closed. Patronize only reliable dealers and insist that the stock shall be entirely free from disease and in perfect condition. In disregarding this advice you are liable to introduce into your new orchard or berry patch troubles that it will take years to overcome.

In writing of the comparative merits of calcium arsenate and arsenate of lead, W. S. Regan of the Massachusetts Experiment Station at Amherst, says: "The killing efficiency for the powdered forms of arsenate of lead and calcium arsenate, pound for puond, is about equal, the former containing about 33 per cent of arsenic and the latter about 43 per cent. Based on an equal arsenical content for a given amount of spray solution, there is a slight advantage in killing power in favor of arsenate of lead. Arsenate of lead is the best poison to use alone. Calcium arsenate cannot be used safely alone upon foliage, but must be combined with milk of lime or a fungicide, such as lime sulphur or bordeaux mixture. If combined with milk of lime its cost is increased so that it is practically equal to that of arsenate of lead, thus giving the latter the preference because of superior killing power. Arsenate of calcium is the only arsenical which can be safely combined with lime sulphur or other sulphid sprays, and this combination is the logical orchard arsenical fungicide. Arsenate of lead seems to work slightly better with bordeaux mixture, but calcium arsenate is probably cheaper, so that the question of which to choose for use with this fungicide is mainly a matter of convenience. Prospective purchasers of calcium arsenate should buy only from reliable dealers, and should follow directions for application carefully."

Carbon bisulphide is now claimed to be the most effective means of ridding orchards and fields of ground squirrels and gophers. The treatment now being used is what is known as the waste ball method which when properly applied, it is said, will kill 90 per cent of rodent pests. The method of using the carbon bisulphide waste ball is after opening the

container to pour enough water on top of the liquid to completely cover it so as to prevent evaporation. In using a cork, seal with glue, mucilage or glycerine. Place the required number of waste balls in a bucket and pour in enough carbon bisulphide to completely cover them. Then place a waste ball in every burrow of the colony or village. Allow at least two minutes for the gas to permeate the burrows, and then ignite the gas in each burrow with a torch or match. Please be careful when igniting the gas; the operator should stand well to one side when doing this. The waste balls should be dropped as deeply as possible in the burrows and care should be taken not to cover them when closing the opening or mouth of the burrow. When all the burrows have been ignited close them up, using plenty of earth; pack the opening of the burrows tightly with the feet. Be careful in igniting the gas that there is no dry vegetation around the burrows as the burning gas is liable to start a fire.

In planting your cherry orchard do not forget your pollenizers. As you will probably plant Royal Annes, Bings or Lamberts, the varieties that will pollenize these standard cherries are the Long Stemmed Waterhouse, Tartarian, Black Republican, Coe, Elton, Wood and a number of seedlings. The Long Stemmed Waterhouse is considered the best as apart from its being one of the most efficient pollenizers it brings a price on the market almost equal to the Royal Ann, Bing, or Lambert.

Remarkable results are now being obtained by the use of sulphur for many soil crops and in preparing soils to secure more complete action from the use of other fertilizers. Some of the highly desirable results secured through the use of sulphur are that it improves alkali soils, promotes nitrification and transforms latent phosphates and potash into available plant food. If you are interested in using sulphur you will find it worth while to secure a bulletin on the subject from your nearest agricultural college experiment station.

The home garden on the fruit ranch should not be neglected or forgotten. To secure the best results the garden should be planted in long, straight rows and cultivated once a week with a horse, according to United States Department of Agriculture specialists. If this much is done by the men the work of the women will be materially reduced. The care of a home garden is not hard work if the fitting of the land and the main part of the cultivation is done with horse-drawn tools. Plan the farm garden right, work it right, and it will prove the most profitable piece of land on the farm.



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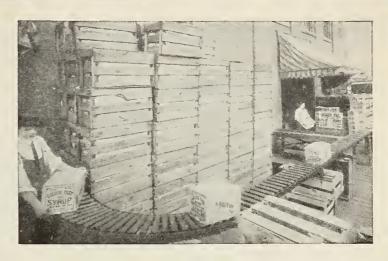
Handle Things by Gravity

EVERY pair of hands and legs you relieve from lugging, wheeling or hauling crates, barrels, boxes, etc., from place to place, immediately becomes available for more productive work. And when you do that costs start to drop; output and profits increase.

The Mathews steel ball-bearing Roller Conveyer not only takes the place of human labor, but it entails no expense for power. *Gravity* operates it!

The Mathews carries most anything most anywhere—over, under or around obstacles, or straight-away. Portable or permanent installation. No upkeep worth mentioning; never goes on strike; demands no pay envelope; incurs no power bills!

Our engineers' suggestions as to how and where the Mathews can be made profitable to you cost nothing. Write.



Packing, warehousing and shipping; loading and unloading cars, trucks and wagons—all can be accomplished more quickly and more cheaply with the Mathews Gravity Conveyer. A size and style for every purpose.



MATHEWS GRAVITY CARRIER CO.

133 Tenth Street, Ellwood City, Pa.

Dranch Factories: Port Hope, Ontario-London, England

What They're Doing in California

Sufficient water for the coming growing season is reported to be the one big thing that is now occupying the attention of the farmers and fruit growers of California. In the Santa Clara Valley not only farmers and fruit growers, but the business men as well have been actively engaged for the past two months in the preliminary work of organizing to perfect some system of conserving and increasing the underground supply of water for irrigation purposes.

Good prune orchards in the Santa Clara Valley are reported to be still holding up in price and \$2,000 per acre is the figure quoted for good producing orchards. Many growers there, it is stated, have refused to sell at this price. Those who are looking into fruitland prices closely in California say that whether such values can be maintained depends upon the quantity and quality of the coming season's crop and the base price to be fixed by the California Prune and Apricot Growers' Association.

The diversity of fruit and vegetable shipments from some of the districts in California make interesting reading. As an instance: There were 5731 carloads of products shipped from Turlock during the year 1919, which is the largest in its history. Cantaloupes led the list with 2719 cars. The list as given out by the two railroads is as follows: Beans, 113 cars; barley, 98 cars; cantaloupes, 2719 cars; canned goods, 209 cars; casabas, 296 cars; dried fruit, 71 cars; grain, 220 cars; corn, 56 cars; grapes, 307 cars; hay, 13 cars; Honey Dew melons, 41 cars; livestock, 170 cars; peaches, 79 cars; peach pits, 3 cars; Persian melons, 3 cars; spinach, 9 cars; sweet potatoes, 203 cars; watermelons, 1037 cars; miscellaneous, 84 cars.

P. J. Dreher was recently elected president of the California Fruit Growers' Exchange. Mr. Dreher has been identified with the citrus fruit industry of the state since 1886 and was one of the leaders in perfecting the system now in use there of coöperative marketing of citrus fruits.

Realizing the strength and permanency of the California Fruit Growers' Exchange it is reported that independent citrus fruit operators are contemplating an organization to represent them in their operations in the citrus fruit belt. This move is said to be due to the gradual extension of the coöperative organization which is reported to be handling 72 per cent of the citrus fruit crop of California. One of the features which the independent organization is proposing is to buy the fruit it handles on a spot cash basis.

Wine grape growers in California are so encouraged over the success attained last year in drying their product and the satisfactory prices received that they are now reported to have abandoned the idea of plowing up their vineyards. Contracts that are being made for wine grapes in California this year are said to run as high as \$70 per ton. It is also found that by blending the wine grapes with some of the dark red and purple varieties that a juice is obtained that makes a high grade commercial grape juice drink and grape syrup.

Pacific Coast headquarters for the United States Bureau of Entomology were opened in Sacramento this week. The bureau concentrates its attention on the study of insect pests that infect growing crops. Work in California, Nevada, Oregon, Washington, Arizona and New Mexico will be directed from the Sacramento headquarters.

Peach growers in the Sacramento Valley are expecting \$100 a ton for this year's crop. The highest price paid last year was \$85.

Bits About Fruit, Fruitmen and Fruit Growing

The market for Northwestern box apples picked up during the past month and showed a much stronger tone, but the car shortage handicapped shippers and prevented as large a distribution of fruit as the market was willing to take. Indications at the present time are that the stocks of box apples in the Northwest will be cleaned up at satisfactory figures and that cars will be more plentiful.

According to a recent statement of Charles J. Brand, general manager of the American Fruitgrowers, Inc., which owns large holdings of orchards in various sections of the country, the officers of that corporation are not worry-

ing about the future success of the apple industry. Mr. Brand says that the company he represents has faith in the future of the apple business or they would not have made such large investments in it. Continuing he remarked: "There may be years when apples will sell at less than the cost of production, but that is only what may be expected in any business. Such years will teach us to organize our productive and marketing methods upon a more efficient and economical basis and probably they may result in a general organization of all apple growers into some sort of an association for the protection and furtherance of mutual interests. This can never be done during prosperous years; hard times alone will bring producers together upon this kind of a basis."

The Joseph J. White Company of Lisbon, N. J., which is endeavoring to improve the huckleberry so that it will be grown and cultivated the same as other bush fruits, announces that its campaign last year to secure fine samples of these berries received widespread attention. Letters of inquiry in regard to the proposition were received from thirty-eight different states and also from Alaska and Canada. Over one hundred samples of blueberries were received, nearly all of which were smaller than those produced on plants already tried and discarded. No berries of the required size were sent, but one plant was purchased for \$25.00. This, from the Province of Quebec, Canada, had berries over five-eighths inches in diameter. It was of a northern species not likely to be of value in New Jersey, but was especially wanted for the breeding work of the United States Department of Agriculture. The offer of \$50.00 for a blueberry or huckleberry bush with berries as large as a cent (three-quarters inches across) is continued this summer. Plants with berries of this size are needed to cross with such plants already found in New Jersey. If they can be located in states north or south they will make possible the development of fine blueberries with a greater range of adaptability to climate.

While imports of fruits of various kinds

While imports of fruits of various kinds are being brought into the United States it is something of an innovation to know that quite a large quantity of dried currants from Greece are finding their way to the ports of Uncle Sam. During the month of February, according to a report from the United States consulat Patras, 1,500 tons of this dried fruit valued at over \$1,000,000 were sent to America. The total amount of stock for shipment at that time was reported to be 10,000 tons, a large part of which was being bought by American importers.

The amount of potash produced in Germany during 1919 was 946,000 short tons. Two hundred and sixty-four thousand tons of this amount was sold abroad, the remainder being retained for home requirements.

Cannery Notes

At the recent meeting of the Northwest Canners' Association held in Portland, J. O. Holt of Eugene, was elected president; W. G. Allen of Salem, vice-president and D. I. Matthews of Portland, secretary-treasurer.

The Oregon Public Service Commission recently granted the A. Rupert Company, Inc., permission to construct a spur track at Falls City, Oregon, in order to allow the company to extend its shipping operations.

The Rogue River Valley Canning Company of Medford, is already making contracts for the 1920 season's pack of vegetables and all kinds of fruits.

The Washington Dehydrating Company, which operates plants at Yakima, Grandview, Wenatchee and Walla Walla, handled 7,000 tons of green fruit from July 1, 1919 to March 1 of the present year. The amount paid growers for fruit was over \$200,000.

Fruits and vegetables to the value of \$40,000 were put up by the cannery at Ashland, Oregon, during the past season. The quantity of product canned was as follows: Tomatoes, 200,000 pounds; apples, 143,000 pounds; peaches, 125,000; pears, 87,000; plums, 15,000; beans, 14,418; apricots, 4,418; cherries, 2,150; pumpkin, 2,500. The number of cans of all sizes used was about 120,000, of which over 50,000 were gallon containers.

According to cannerymen the price of canned goods will be higher this year than last. The high prices of fresh fruit and high labor costs are given as the reasons.

The plan to consolidate the Lewis County

cannery, located at Chehalis, Washington, with the Puyallup and Sumner Fruitgrowers' Canning Company has been abandoned and the plant will be operated during the coming season as an independent local company. A number of prominent business men in the county have become interested in the concern which has been placed under the management of Dan W. Bush.

Construction work has been started on a new \$40,000 cannery at Stockton, California. The plant will cmploy about 350 workers and expects to handle 2,000 tons of green fruit and to pack 2,000 tons of grapes and dried fruit. The new plant will be completed in time to start the season with the cherry crop.

Although there are now 38 fruit and vegetable canneries in San Jose and other sections of Santa Clara County, California, making it the fruit canning center of that state, extensive additions are being made to several of the plants in order to take care of an expected large increase in the business this year.

Sacramento Valley canneries started putting up spinach on March 9. The crop is exceptionally large.

Many Tractors Sold at Hood River.

The Hood River Glacier notes that the interest of orchardists in tractors as motive power for their industry is at high pitch here. Since the first of the year a total of 32 tractors has been sold at Hood River. The sales reported are as follows: Cletracs, 15; Fordsons, 9; Case, 3; Fageol, 3, and International Harvester Co., 2. Dealers declare that sales would have been heavier to date, had more machines been available.

Roads to Be Lined With Trees.

Through the generosity and public spirit of the Washington Nursery Company the principal roads leading into the town of Toppenish, Wash., are to be lined with hardwood shade trees. The trees which were donated by the nursery company consist of several hundred walnuts, elms and maples and will be planned by the local commercial club.

The Strawberry Weevil.

The New Jersey Experiment Station says the strawberry weevil can be fought off by dusting the plants as the buds appear. The dust is composed of one part dry arsenate of lead and five parts powdered sulphur. This does not kill all the weevils, but drives them away.

Cheesecloth bags, the naked hand and other devices were used by growers in New Jersey who did not care to buy the powder gun, but to Tony Rizotte belongs the honor of evolving the most ingenious hand device for sifting. He covered a common wire horse muzzle with one thickness of copper mosquito netting and drew the edges up to the rim. The inventor then bent a 3-foot hickory sapling, fastening it to opposite sides of the rim. This served as a handle by which the improvised basket filled with the powder could be twirled with more or less force, depending on the width of the rows.

Planting the Peach and Plum.

As soon as the trees are set out cut back the tops. Peaches and plums should be headed 18 inches from the ground and apples and pears 32 inches. Young trees require the best of care and cultivation. Practice frequent cultivation during the summer and plant a cover crop in the early autumn.

CONSULTING HORTICULTURIST

PROFESSOR W. S. THORNBER

Formerly

HEAD OF THE DEPARTMENT OF HORTICULTURE AND LANDSCAPE GARDENING

Later

DIRECTOR OF THE EXTENSION SERVICE OF THE STATE COLLEGE OF WASHINGTON

WILL ADVISE with fruit-growers upon all horticultural problems, including selection and preparation of orchard lands; propagation and care of nursery stock; planting and care of young orchards and small fruit plantations; the control of codling moth, San Jose scale, blight and other orchard pests; the preparation of lime-sulphur at home and the mixing of other sprays; economical orchard management; the irrigation and fertilization of orchard lands; the use of cover-crops and grass mulches; the pruning of fruit trees, shade trees, shrubs, bushes and vines; the renovation of old or neglected orchards, top-working or replacing of poor or unprofitable trees, and the examining and the working out of practical management plans for large orchards and orchard companies.

If your orchard has not been a financial success, and you wish to determine its possibilities or you wish to improve your orchard, reduce your losses and increase your returns I will assist you in working out your problem.

WRITE FOR TERMS

W. S. THORNBER LEWISTON, IDAHO

The Science of Dehydration

(From California Cultivator, March 13, 1920)

What is dehydration? We asked Dr. Clements of the Agricultural Department of the Los Angeles Chamber of Commerce this question and he answered:

"Dehydration means the reduction of organic materials to a desiccated condition without alteration of cellular structure or chemical change. In other words, the elimination of the greater part of the water content."

In addition, Dr. Clements said:

"Two years ago, while under stress of war, the British government made some interesting and very successful tests in the dehydration of berries and other highly colored fruits and vegetables in an atmosphere of nitrogen, but the process was far too expensive to be utilized in general manufacture. The object of the British government at that time was to overcome the enormous cost of \$3,000 per car Los Angeles to Port Sarnia-recognizing that one carload of dehydrated berries would be the equivalent of 20 carloads of the fresh iced material, the strawberries having been frozen in barrels and kept so until ready for preserving. I might add that the expense through dehydration in nitrogen was much greater than the 13,000 under icing.

"The necessity for this neutral atmosphere is due to the coloring matter of all fruits and vegentables being iron and iron salts, and to the instability of their chemical formation and susceptibility to oxygen and ozone. In any dehydration, either electrical or otherwise in which there is vibration or artificial wind drafts, the excess of oxygen, and a still more deleterious product—ozone—results in the blanching of the product.

"The International people seem to have stumbled upon this one principle accidentally—the use of carbonic acid gas, being a by-product of simple combustion in the creation of heat within the deshydration plant itself, carbonic acid gas being so much heavier than the normal atmosphere, forces it to the top of the container and excludes any possibility of ozone or excess of oyxgen. Another item of interest is the embodiment of the humidor principle, which has been accepted, lock, stock and barrel, by the United States government in the kiln drying of all woods necessary to the airplane. The humid atmosphere moistening the superstructure or envelope of the material to be dehydrated stimulates capillary attraction, making release of retained moisture even, and a uniform product results.

"This makes a very complicated problem and places dehydration directly in the hands of the chemist and biologist."

Import Many Pounds of Filberts.

During the year of 1919, 3,778,985 pounds of shelled and 16,767,304 pounds of unshelled filberts were imported into the United States. The value of these nuts was over \$7,500,000. The heaviest importation of filberts was from Italy, which furnished over 14,000,000 pounds.

BETTER FRUIT

Fight Film To Save Your Teeth

All Statements Approved by High Dental Authorities



It is Film that Ruins Teeth

This is why brushed teeth discolor and decay. And why old methods of cleaning have proved so inadequate.

Your teeth are covered with a slimy film. It clings to them, enters crevices and stays. That film is the cause of most tooth troubles.

The tooth brush does not end it. The ordinary dentifrice does not dissolve it. So, month after month, that film remains and may do a ceaseless damage.

That film is what discolors — not the teeth. It is the basis of tartar. It holds food substance which ferments and forms acid. It holds the acid in contact with the teeth to cause decay. Millions of germs breed in it. They, with tartar, are the chief cause of pyorrhea. Also of many other troubles.

Dental science, after years of searching, has found a way to combat that film. Able authorities have proved the method by many careful tests. And now, after years of proving, leading dentists all over America are urging its daily use.

Now Sent for Home Tests

For home use this method is embodied in a dentifrice called Pepsodent. And a 10-Day Tube is sent without charge to anyone who asks.

Pepsodent is based on pepsin, the digestant of albumin. The film is albuminous matter. The object of Pepsodent is to dissolve it, then to day by day combat it.

The way seems simple, but for long pepsin seemed impossible. It must be activated, and the usual agent is an acid harmful to the teeth. But science has discovered a harmless activating method. And millions of teeth are now cleaned daily in this efficient way.

Let a ten-day test show what this new way means. The results are important, both to you and yours. Compare them with results of oldtime methods and you will then know what is best.

Cut out the coupon now so you won't forget.

Pepsadent

The New-Day Dentifrice

Now advised by leading dentists. Druggists everywhere are supplied with large tubes.

See What It Does

Get this 10-Day Tube. Note how clean teeth feel after using. Mark the absence of the slimy film. See how teeth whiten as the fixed film disappears. Learn what clean teeth mean.

Ten-Day Tube Free

THE PEPSODENT COMPANY,
Dept. 426, 1104 S. Wabash Ave., Chicago, Ill.

Mail 10-Day Tube of Pepsodent to

Name

Address

One tube to a family.

Soil and Climate Big Factors in Berry Growing

By D. E. Towle, Gresham, Oregon

THINKING your readers would be interested in learning something of the possibilities of berry farming in Eastern Multnomah County, especially in the territory tributary to Gresham, I concluded to ask you for a little space. If you will glance at the county map you will note Gresham's location, some 20 odd miles southeast of the confluence of the Willamette and Columbia rivers and on an air line towards Mt. Hood. It seems that nature believes in specializing and providing special localities for certain products—to-wit, Hood River spells apples; Southern California Sunkist oranges, and Gresham berries. Why? Well, there is a reason and it can be expressed in two wordssoil and climate.

The soil is different from the average soil of the coast country, being a mixture of volcanic ash and Columbia river sand forming a soil that is easily tilled, very fertile and being underlaid with a water-bearing sand, the soil is sub-irrigated and with good cultivation holds an ample supply of moisture to mature the finest quality of strawberries, raspberries and loganberries in the driest seasons. There is also another peculiar local factor that helps to bring the berries to their high standard of perfection which in time will give them a world reputation for quality. It is that life-giving sea breeze that naturally rolls up the Columbia river during the summer season and spreads out over this favored locality. To convince yourself of this, please take another look at the map, and knowing as you do that the prevailing summer wind is from the Northwest, please draw a line from the mouth of the Columbia river in a southeast direction and you will be convinced that Gresham's berry territory gets the sea breeze direct.

I have briefly outlined the reason for our success in berry growing in soil and climate. The third reason is intelligence and industry by the farmer and then success is assured. This opinion is based on six years of observation and experience. The quality of the berries, especially raspberries and loganberries, is admitted as being superior by our leading coast canners. The berries all come to full maturity with good cultivation and this means good yields. The raspberry harvest usually extends over a six weeks' period. So you can see that the development is nearly perfect. The berries all mature, and the last picking yields the largest berries. The best yields I know of are four tons to the acre, three tons is a good crop, two tons fair and less poor. The picking cost takes about one-third, cultivation costs about one-third and at present values this leaves a good rental for the land. The price of land here ranges from \$200 to \$500 per acre. This price may seem high but good berry lands are worth more. I have no land for sale but have bought some very recently and it is not for sale.

Berry growing in this territory appeals equally to the man with capital

and to those with little means. The unit holding should be not less than five acres and ten acres is ideal for one man to operate and will produce a good living for an average family. Berry farming is not heavy work and is spread out well over the year. Cutting out the old canes and pruning can be done from October 1st to April 1st, and the plowing, cultivating and hoeing during the next three months, then the harvest and a thirty-day vacation season before you start the new berry year. In addition to an acreage of berries we recommend the keeping of a flock of 100 or 200 hens, a pig and a cow. The Gresham territory is well developed. We have a large mileage of hard surfaced roads and the balance of the roads are good the year around. Electricity is available in most of the territory for light and power purposes at a reasonable price. We also have city gas, telephones and special daily paper deliveries; rural mail delivery, good grade schools, a central Union High school. This is a union of five rural districts with Gresham. We have an enrollment of 225 students and a very efficient staff of instructors. The studies include a course in agriculture, manual training and domestic science. The fact is your child graduating from this school is well qualified to take up any line of work except the profession. We have a jitney service that calls for your child in the morning and returns it safely after school. Nearly all of the different religious denominations are organized in the district. To enumerate, Presbyterian, Methodist, Free Methodist, Baptist, Evangelical, Lutheran, Catholic and Christian Science, and if you cannot find a church house in these enumerated you are within an hour's ride of the city of Portland in which all sects can find a church home. Gresham has an hourly electric car service to Portland and also an auto jitney service. If this is not satisfactory use your own car. It is a beautiful 45-minute drive. Being near the city is no mean advantage for our locality, especially from a berry grower's stand-point, as berries must be picked and we look to Portland for the pickers. Berry picking is a school vacation-time job and affords a pleasant and profitable camping out vacation to the city women and boys and girls. The pickers express their delight in the change from the restrictions of city life to the freedom and pure air, sunshine and shade and the chance to commune with nature. Berry picking is not hard work but the work is good exercise. picker is benefitted mentally by relaxation, physically by the exercise and materially by the cash received.

So, Mr. Editor, to sum up the outlook for berry growers in the Gresham district, I think you will agree with me, that the future prospect is really bright as the combination as enumerated is hard to beat. First, suitable soil and climate for production; second, a quality that is par excellance and third, the territory adapted to these products is limited; fourth, being near the city insures the harvest help, fifth, we have a State Growers' Association, a State Manufacturing Association with the selling end in good hands. Sixth, at least six large going concerns, privately owned, who are in the market for ten times the berry product obtainable. Seventh, national prohibition and a substitute needed without a kick. Eighth, we have a healthy growers' coöperative association that is ready to help the newcomer and will try to steer him right as to location, methods of culture, etc.

Now a last word to the prospective

Now a last word to the prospective berry grower. If you are convinced that what I have written is true and if you are interested and would like to better your circumstances by growing berries or if you are not sure of the truth of these claims made for this territory, all we ask you to do is to come out and look our locality over and satisfy yourself. Personally, I have no special interest in your welfare but I have that common interest in community development and the helping of my fellowmen that prompts the writing of this article.

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SAN FRANCISCO

Insects and Diseases of the Loganberry

By W. S. Brown, Chief of the Division of Horticulture, Oregon Agricultural College

THE loganberry is not affected by many serious insect pests. The three that seem to do the most damage are the raspberry cane maggot, the leaf hopper, and the raspberry rootborer.

The cane maggot causes the cane to wilt or droop. A careful examination will disclose a bluish ring just under the bark near the surface of the ground. The cane should be cut off just below this ring and destroyed. This will kill

the maggots working within.

The leaf hoppers are sucking insects. They do their damage by sucking out plant juices from the leaves and young canes. They should be attacked while young or in the nymph stage. They may be killed by some contact remedy such as whale-oil soap, one pound to ten gallons of water; kerosene emulsion 10 per cent solution; or a mixture of Black-leaf 40, one-half pint, plus four pounds of whale-oil soap, to 100 gallons

The root borer, when present, causes the infested plant to become yellowed and the berries to be small and seedy. Two years are required for the borer to mature. The first season it attacks the young canes, girdling them near the surface of the soil. The injured canes may be readily observed in late summer, lying flat on the ground with the foliage wilted. With a heavy pair of gloves the injured cane can be given a twist that will break it off at the girdle. In most cases the borer will remain in the detached cane, which should be removed from the field.

The most serious diseases are the crown gall, mushroom root rot, and anthracnose. When affected by crown gall the plants gradually turn yellow and lose their vigor. By a careful examination corky swellings will be found on the roots, usually near the surface of the ground, but often on the smaller roots. This trouble occurs very frequently as a swelling or canker

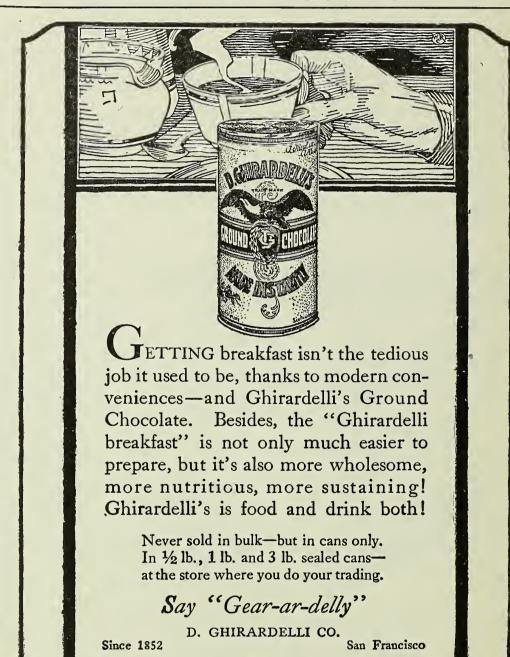
along the side of the cane.

Mushroom root rot is a fungous trouble which attacks the roots of the plants, finally causing their death. The disease grows on old tree roots and stumps, and is more apt to affect plants set out on newly cleared land. When affected with either of the above diseases, the plants, with their roots, should be removed at once and burned. No new plants should be set in their places before three years have elapsed.

A fungous disease called anthracnose seems to have done more damage to the loganberry than any other trouble in the state. It is a disease causing lightish-gray spots to appear on the leaves and canes of the plant, and may attack the drupelets of the fruit, also, causing them to turn a light gray color. Ordinarily this disease can be kept under control by carefully cutting out the old vines after fruiting and burning them. If at this time some of the new canes are found to be infested seriously they should be thinned out, also. When the infection becomes serious, spraying

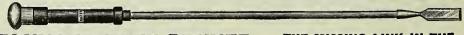
with bordeaux mixture 4-4-50 is recommended. The mixture is best applied with a resin fish-oil sticker, to improve the sticking and spreading qualities of the bordeaux. The first application should come about the time the first leaves have attained good size. The second spraying should be applied just before the blossoms open and the third may be put on about the end of summer,

in case new infections begin to make their appearance on the young canes and foliage. To protect the fruit, some colorless mixture, like Burgundy mixture, should be applied about two weeks after the petals fall. The resin fish-oil sticker should be used with this also. The formula for Burgundy mixture is as follows: Two pounds copper sulphate (bluestone), three pounds sodium carbonate (washing soda) and 100 gallons of water. Mix each of the chemicals separately with water before bringing them together.



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Department of Agriculture, Etc.

Continued on page 10.

all rooms except the two middle rooms on the north side, which were equipped for special low temperature work and have two inches more insulation and correspondingly heavier doors. A brine coil is hung on one side of each room and is covered with a baffle board open at the top and bottom to permit the circulation of air over the coil. One section of this baffle board is hinged to allow access to the coils. Next to this block of finished rooms is space for four more rooms. It is planned to complete these in the near future. The handling room is located next to this space and is equipped with tables for sorting, scales, trucks, and the various paraphernalia of a cold storage plant. In one corner of this room is the elevator shaft.

The second floor is divided in the same general way as the first, eight cold storage rooms being directly over the first floor rooms and the unfinished storage space and handling room occupying the same relation to the storage rooms as in the first floor plan. The space over the engine room, 42x26 ft. is a well-equipped plant physiological laboratory. This laboratory is, of course, an exceedingly important part of the equipment, as the physiological aspects of storage are particularly em-

phasized in the work.

The importance of plant physiological work in connection with cold storage is evident when it is considered that most fruits and vegetables are stored alive and the problem is to keep them alive and in an attractive condition until they are to be used. The determination of the best condition for storage of any particular fruit or vegetables then requires a study of the life processes which go on in it after it is removed from the tree or the soil where it was grown, together with a study of the effect of the various environmental conditions obtaining in a storage plant upon these processes. The harvesting and handling of the produce before storage and the conditions under which it is grown often markedly influence the storage life. These factors must be considered in fundamental studies.

There are a number of problems relating to the storage of fruits and vegetables under investigation at the present time. One of particular interest is the determination of the effect of freezing temperatures on various kinds of fruits and vegetables. This includes determining the actual freezing points of the tissue, the temperature at which frost injury occurs, for it is, of course, possible that certain fruits or vegetables may be injured by low temperatures without the tissue actually freezing, and the effect of freezing on the produce. The development of methods for defrosting and methods for the utilization of frozen produce are also under investigation.

Another problem of rather wide application under investigation is the effect of gases, such as carbon dioxide,

carbon monoxide, and the various gases given off by car heaters, on fruits and vegetables. The effect of varying degrees of humidity on fruits and vegetables is also receiving considerable attention. Other problems of less general interest have been taken up, such as the cold storage of celery, and the changes which take place during storage in grapefruit, pears, apples and tomatoes.

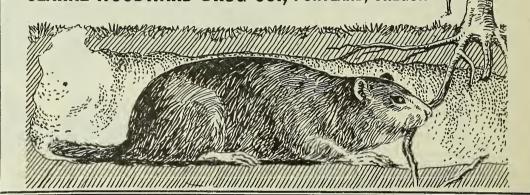
The number of problems under investigation at any one time is, of course, limited by the size of the staff and the funds available. An effort will be made to take up, as rapidly as possible, the problems of fundamental importance to the cold storage of fruits and vegetables. It is hoped that results of value both to the producer and to the cold storage industry will be obtained in this plant.

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Dusting and the Spray Gun, Etc. Continued from page 8.

Low pressure from these small capacity outfits does not produce a spray of the proper consistency to accomplish a satisfactory coating. The liquid leaves the gun in a coarse, splattering stream. There is no fineness of division of the particles and the only way that a tree can possibly be covered is to drench and thereby waste much material. As I have said before, it is my belief that finely divided spray which has much the same consistency of the dust particles, which control calyx worms, operates in the case of properly applied liquid solutions. If this spray is not broken up into a light drifting mist the principal of calyx worm control is destroyed and poor results are bound to follow. There is no possible chance of obtaining much calyx protection in tops of trees with a gun throwing a coarse splattering spray. This might possibly be accomplished from a tower. Gravity is the factor which allows the poison to reach the calyx ends of the uppermost apples. The spray material must be placed there in the proper condition and in sufficient amounts to effect a coating as it falls. A coarse spray goes up in large droplets and comes down in much the same form; a large portion passing over the tree in the form of an arc. Unless a very excessive amount of spray material is

thrown into the top of the trees only a few of the calyx ends will receive much spray and these will be decidedly spotted.

spotted. In summarizing then, the successful use of the spray gun depends almost entirely upon the manner in which the spray is broken up. A pressure of 250 pounds on a large sprayer delivers a beautiful spray from two guns. This amount of pressure on a small outfit does not produce the same sort of spray. It takes at least 300 pounds with a 3½ horse power outfit to approach this spray and then it is nowhere nearly as good. I am not sufficiently versed in mechanics to explain just why this difference occurs. Nevertheless there is a difference and anyone who will handle the delivery from the small and large outfits can immediately feel the difference in the "life" of the spray. I am not conducting a propaganda for any one large type of sprayer, unfortunately at the present time there is only one on the market. Our other sprayer manufacturing companies must bring up their standards if they are to meet the demands of the orchardists for there will be a very great demand for these during the next few years. With the coming of increased facilities for proper spraying I firmly believe that we will see a marked improvement in our codling moth control and a yearly saving which will amount to many thousands of dollars.

TABLE 1—RELATION OF SIDE WORMS TO CALYX WORMS. Hood River, Oregon, 1917, 1918 and 1919.

1917		Total Per cent	Pcr cent Side	Per cent Calyx	Relation of Side to Calux Worms
Exp. No.	How Applied	Worms	Worms	Worms	in percentages
1.	Last dust spray omitted	12.96	9.28	3.68	71.6 to 28.4
2.	Dust applications	5.37	5.00	.37	92.99 to 7.01
3.	Last rods spray omitted	14.33	10.54	3.79	73.55 to 26.44
4.	Rods	1.43	1.14	.28	80.00 to 20.00
	Check	65.13	20.62	44.51	31.68 to 68.32
1918					
	Dust	2.68	2.54	.14	94.7 to 5.2
	Liquid (gun)		.44	.00	100.00 to .00
	Check	17.64	12.9	4.7	73.29 to 26.7
1919					
9.	Rods in calyx, guns in others		2.05	.34	85.74 to 14.28
10.	Gun, all sprays		1.91	.35	84.24 to 15.71
11.	Rods, all sprays		3.12	.29	91.64 to 8.54
12.	Guns, 1 to 12 feet high		.99	.09	90.9 to 9.0
13.	Guns, 12 feet to tree top		4.2	.9	81.13 to 18.86
14.	Check (unsprayed)	53.6	24.2	29.4	45.16 to 54.83
	·				

Note—1917, five standard sprays applied unless otherwise stated; 1918, four standard sprays applied; 1919, five standard sprays applied.

In experiment 12, fruit separated from ground to 12 feet. Experiment 13, from 12 feet to tops of trees.

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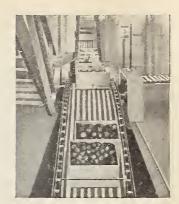








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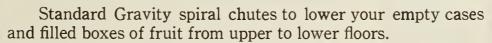




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Growing and Culture of Almonds

Continued from page 6.

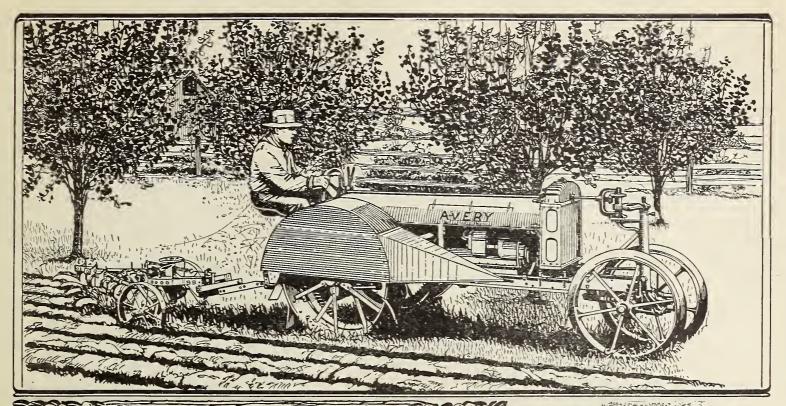
and in the lower lands, form the heavier soils.

The various conditions mentioned above are what the tree should have for best conditions of growth and production. Oftentimes these conditions may be approached without the soil being as deep as ten or twelve feet. Exceptions to this will be mentioned in discussing the various almond districts of the state. It is essential to understand that trees, while growing and bearing on shallow soils in some localities, do so because of other exceptionally favorable conditions; either the soil is exceptionally well drained and yet sufficiently retentive of moisture, or the humus in the soil is plentiful and the roots are able to work into the underlying partially decomposed rock for moisture and some plant food. In such localities the trees bear comparatively well because of the exceptional freedom from frost in the spring. Trees in these lo-calities are generally smaller than on the deeper, richer soils, and where other conditions are equal, they bear crops in proportion to their size.

Almond Districts

Almonds are grown in nearly every county in California. In some counties the few trees growing only occasionally succeed in producing a crop of nuts. There are sections in nearly all parts of the state, however, where they are a success commercially. Within these sections may be found desirable and undesirable locations, depending upon soil and moisture conditions and freedom from injurious frosts. Any discussion of a district, therefore, does not necessarily mean that all lands within that district are uniformly adapted to almond culture. On this account it is impossible to define a district any more closely than to name the center and include with it the outlying districts. In the same way it is sometimes impossible to say just where one district begins and another ends. Adaptability of any special location can be determined only by careful study of the land itself and diligent inquiry of those familiar with it.

As far as possible, districts should be chosen where a definite cold winter season exists. Warm weather and lack of freezing temperatures do not hold the trees fully dormant and any frequent occurrence or unusual continuation of spring weather in the winter will start the trees into growth; cooler weather following, interferes with the normal flow of sap, results in injury to the tree and blossoms, and often causes gumming of the nuts which mature. This condition exists largely in the lower elevations in Southern California and especially in the coastal portion, where the ameliorating influence of the Pacific is felt. This same condition exists close to the coast in the northern portion of the state. Further inland and at higher elevations the winters are more pronounced, and where these are not too severe or prolonged the almond thrives best.



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sells at a low price—is a smaller tractor but
very similar to the Six-Cylinder Model "C"
Avery. Is equipped with a four-cylinder
motor.

Some Facts About Dry Lime Sulphur

By A. J. Gunderson, Horticulturist for Sherwin-Williams Company

WITHIN recent years the Sherwin-Williams Company has placed on the market a new spray product known as Dry Lime Sulfur. This has been brought about by a process of stabilizing 33° Baume lime sulphur solution by the addition of a stabilizing substance such as a carbohydrate or a sugar followed by a special process of drying. Orchardists and experiment stations have obtained excellent results with dry lime sulphur even when used in lesser amounts than would have been thought necessary when judged from the experience had with ordinary lime sulphur solution.

While this fact has proven of great interest to all orchardists and experiment stations it has been very disconcerting to a few critics who like to believe that since sulphur, chemically speaking is always sulphur, it is impossible for the sulphur in Sherwin-Williams' dry lime sulphur to be more efficient per unit of sulphur than the sulphur in old-fashioned lime sulphur solution. With equal assurance one might assert that carbon is always carbon and that willow charcoal, graphite and the diamond are equally efficient and yet we know that the diamond is worthless for kindling a fire and for writing on paper or as a component of gunpowder; likewise, willow charcoal is not a brilliant, sparkling gem in demand by jewelers nor can it be used to cut glass.

It has been definitely established that lime sulphur solution must be used at the rate of from one gallon to eight gallons in order to kill San Jose scale. Every fifty gallons of diluted spray therefore will contain approximately five and one-half gallons of lime sulphur solution, or a total of approximately fourteen pounds of sulphur in solution. On the other hand the results of experiments conducted in orchards infested with San Jose scale have shown that dry lime sulphur controlled San Jose scale just as effectively at strengths recommended by the Sherwin-Williams Company although containing considerably less amounts of sulphur in solution. Certain experiments conducted in the states of Washington and Illinois in the spring of 1919 have further confirmed such recommendations and in certain cases dry lime sulphur proved even more effective in the control of San Jose scale than lime sulphur solution.

Experiments conducted in certain other states have shown definitely that dry lime sulphur controlled apple scab and peach leaf curl just as effectively as lime sulphur solution. Furthermore it has been demonstrated that dry lime sulphur used in combination with arsenate of lead did not cause foliage injury and incidentally stimulated an unusual finish and color on red varieties of apples.

The explanation recognized by entomologists of this country as to how lime sulphur kills San Jose scale is that sulphur combined with calcium to form polysulfides of calcium oxidizes after having been applied to the infested trees and that oxygen is removed from the scale, resulting in its chemical suffocation. It is very probable that entomologists have overlooked the fact that sulphuretted hydrogen or hydrogen sulfide is extremely toxic to both insect and plant life and that it plays an important role in sulphur insecticides.

Sulphuretted hydrogen is a gas which is not generally available commercially and if it were available it could not be applied easily and directly in such a manner as to kill the insect and not injure the tree. The most satisfactory method of applying sulphuretted hydrogen is the indirect one of using calcium polysulphide or so-called lime sulphur.

Lime sulphur solution is a water solution of a compound of calcium and sulphur known to the chemist as calcium polysulphide, together with lesser quantities of compounds of calcium sulphur and oxygen such as calcium thiosulphate, etc. This lime sulphur solution when diluted and used as a spray on scaley trees decomposes in the presence of carbonic acid yielding sulphur, hydrogen sulphide and calcium carbonate. Subsequently other reactions take place in which the sulphur, calcium thiosulphate and other sulphur compounds participate. If there is any difference in the toxic effect of a unit of sulphur in dry and liquid lime sulphur there must be reasons for that difference. Possibly we may never know all of the reasons, but we believe the phenomena may be explained in part as follows:

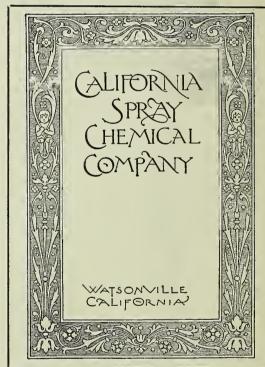
We believe that the spray made from dry lime sulphur has greater wetting and spreading and penetrating power. The film resulting from a spray of dry lime sulphur is less permeable to decomposing gases and vapors; and although more tenuous is more integral and coherent. The film resulting from a spray of dry lime sulphur dissolves anr retains the liberated sulphuretted hydrogen for a longer time. The film directly in contact with the scale insect is decomposed by the carbonic acid and other organic acids produced by the transpiration of the insect perhaps to even a greater extent than by the carbonic acid of the air. Owing to the lesser permeability of the film from dry lime sulphur there is a greater concentration of the toxic vapors for the same length of time or an equal concentra-tion for a greater length of time per unit of sulphur as compared with the film of ordinary lime sulphur solution. In other words, when dry lime sulphur is used a larger percentage of the sulphur content goes into the insect and less to the atmosphere than is the case when lime sulphur solution is used.

It is possible that the toxicity of the sulphur liberated from dry lime sulphur is somewhat greater than that liberated from ordinary lime sulphur solution for the reason that the former is in a state of extreme division, almost colloidal in fact, and the stabilizer retains it as if it were in a sort of a gel.

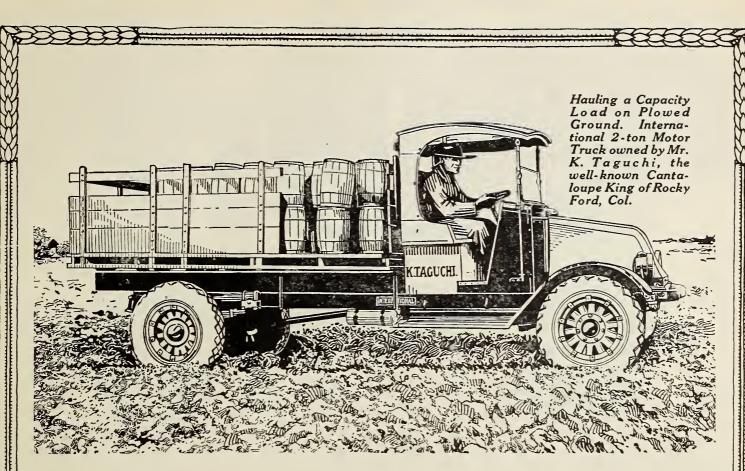
Orchardists are interested more specially in what dry lime sulphur will accomplish under actual orchard conditions. In view of the fact that dry lime sulphur will give just as good results as lime sulphur solution in the same orchard, we believe that the explanation just given is a sound and satisfactory one.

The Sherwin-Williams Company has based its recommendations for the use of dry lime sulphur upon the results of careful orchard tests and further substantiates its claims for this product upon the fact that thousands of fruit growers are using dry lime sulphur with most excellent results. Dry lime sulphur will not only control effectively the insects and fungous diseases for which it is recommended but, furthermore, eliminates all of the objectionable features connected with lime sulphur solution. These include loss due to leakage, freezing, crystallization and great weight in handling. Orchardists everywhere are familiar with these objectionable features.

Dry lime sulphur is rapidly becoming a standard spray material and it is our prediction that it will entirely supplant lime sulphur solution in two or three years.







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WHEN WRITING ADVERTISERS MENTION BETTER FRUIT

The Comparatively Low Cost of Spraying

By Chas. L. Robinson, District Horticultural Inspector, Yakima, Washington.

Notwithstanding the constant educational efforts to teach them, many fruitgrowers do not seem to realize how low the cost of spraying is in comparison with other orchard operations and therefore frequently neglect to follow up one of the most important phases of successful fruit growing. Naturally all growers are anxious to produce as large a percentage of extra fancy fruit as possible. In order to do this it is absolutely necessary for them to keep their trees free from disease and insect pests.

The following figures, therefore, compiled by a Washington apple grower will be of interest to those who balk at spraying on account of the cost. These figures which give the cost per box of applying the lime-sulphur and arsenate of lead sprays are as follows:

Age of Trees:	10	15	20
Lime-sulphur—	Years	Years	Years
One spray	.045	.045	.047
Arsenate of Lead—			
One spray		.02	.02
Five sprays	.11	.10	.10

The above figures are computed on a basis of a crop of 250 boxes to the acre on 10-year old trees, 400 boxes per acre from the 15-year old trees and 500 boxes per acre on 30-year old trees. Amount of material used is based on the recommendation of the horticultural department regarding amounts of material necessary for orchards of different ages. Labor costs are computed on a basis of \$15.00 per day for man, team and sprayer and 40 cents per hour for nozzlemen. Lead is computed on a basis of 30 cents per pound for arsenate of lead and 30 cents per gallon for the lime-sulphur solution, 32 degree concentrate.

There occurred at Wenatchee the past season an instance of which many have probably heard and which could be duplicated without a doubt in a number of districts here if growers would go together on a similar proposition. In brief the Sunnyslope district at Wenatchee had so many worms during the 1918 season that most of the fruit growers were becoming discouraged. Several orchards ran more than 40 per cent to 60 per cent worms and for the section as a whole 25 per cent of worms was considered a very low estimate. Last spring they got together, assessed themselves \$1.00 per acre for the district, which comprised a little over 1000 acres and through the horticultural department they hired a man to supervise their spraying. This plan was so successful that for the 1919 season the entire area averaged less than two per cent worms and a number of growers there have estimated that the \$1,000 investment saved them at least \$50,000.

From the above figures and results obtained in the Wenatchee district it will be seen that no fruit grower can afford not to spray.

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